THE UNIVERSITY OF ALBERTA

REDISTRIBUTIONAL EFFECTS OF INFLATION

AMONG BUSINESS FIRMS IN CANADA

by

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A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES

IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE

OF MASTER OF BUSINESS ADMINISTRATION

FACULTY OF BUSINESS ADMINISTRATION AND COMMERCE

EDMONTON, ALBERTA

FALL, 1970

UNIVERSITY OF ALBERTA

FACULTY OF GRADUATE STUDIES

The undersigned certify that they have read, and
recommend to the Faculty of Graduate Studies for acceptance,
a thesis entitled "Redistributional Effects of Inflation
Among Business Firms in Canada" submitted by Robert Wayne
Jollineau in partial fulfilment of the requirements for
the degree of Master of Business Administration.

ABSTRACT

The question of whether or not business firms are beneficiaries of inflation is a controversial one. The main objectives of this thesis are to empirically investigate two hypotheses which have been advanced as explanations of how business firms gain real wealth during a period of rising prices. These are: (a) the debtor-creditor hypothesis which states that firms gain during inflation by paying-off fixed obligations with depreciated money, and (b) the wage-lag hypothesis which states that inflation causes wages to lag behind prices so that wealth is redistributed from wage earners to business owners.

To attain these objectives statistics were gathered on 255 Canadian firms to determine their net debtor status and their changes in relative wealth position over the period 1958 to 1969. Associations between net debtor status and changes in wealth were examined by means of nonparametric statistical techniques and multiple regression analysis. The observed relationships were then compared to what the two hypotheses would predict and the statistical significance of the comparison evaluated.

The study results clearly indicate rejection of both the debtor-creditor and wage-lag hypotheses as general theories of wealth transfer during inflation. In Canada, business firms have not been beneficiaries of the current inflation through either of these two effects.

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CHAPTER I

INTRODUCTION

Eminent economists, such as Keynes and Fisher[1], have long argued that business firms increase their command over real resources as a result of inflation. This gain, they say, results from business firms paying fixed dollar obligations in the form of debt instruments with depreciated money. Thus the losses of creditors become the gains of business owners.

Similarly economists such as Hamilton and Mitchell[2] have stated that inflation causes wages to lag behind prices to the extent that wealth is redistributed from wage earners to capitalists. These views have been expressed as standard textbook explanations[3] of how bus-

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[1] J.M. Keynes, Tract on Monetary Reform (London, 1923), p. 18; I. Fisher, The Purchasing Power of Money (New York, 1920), p. 59.

[2] E.J. Hamilton, "Prices as a Factor in Business Growth", Journal of Economic History, XII, (Fall, 1952), 325; W.C. Mitchell, Gold, Prices and Wages Under the Greenback Standard. (Berkely, 1908), pp. 275-276.

[3] Examples of this type may be found in L.V. Chandler, The Economics of Money and Banking (New York, 1948), pp. 32, 36-37.

iness firms gain through inflation. Recently, however, the research of such scholars as Alchian and Kessel[1] has tended to modify or cast into doubt these explanations. As a result the issue of whether or not business firms do increase their command over real resources during inflation has become controversial. Resolution of this controversy would be a definite contribution to economic knowledge.

The objectives of this study are to empirically investigate the validity of:

a) the debtor-creditor hypothesis -- which states that firms gain during inflation by paying-off fixed obligations with depreciated money, and

b) the wage-lag hypothesis -- which states that inflation causes wages to lag behind prices so that wealth is redistributed from wage-earners to the owners of firms.

These objectives will be achieved by classifying firms according to their status as net debtors or net creditors. A nonparametric technique will be used to establish the significance of any observed differences between changes in wealth of debtor firms versus creditor firms over the

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[1]A.A. Alchian and R.A. Kessel, "Redistribution of Wealth Through Inflation", Science, CXXX, (September, 1959), pp. 535-539.

recent inflationary time period. Firms will then be ranked in order of intensity of net debtor status and in order of observed change in wealth. A nonparametric method of correlation will be used to measure and establish the significance of the degree of association between these ranks. A similar test will be conducted on firms ranked in order of labour intensity and observed change in wealth. Finally, a multiple regression model will be developed to simultaneously measure the separate influences of the debtor-creditor and wage-lag effects on observed changes in wealth of the sample firms.

During the past three years the Consumer Price Index has risen by 12 percent, earnings per person employed by 13 percent, and corporation profits by 14 percent.[1] Labour and business blame each other for the inflationary spiral of rising wages and prices. Labour spokesmen accuse business firms of unjustifiable price increases, while business men accuse labour of unrealistic and irresponsible wage demands. Government is encouraging both parties to exercise restraint and is hinting at a possible need for regulation of prices and wages. Thus the question of whether or not business firms are actually gaining real wealth through inflation is both

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[1] The Minister of Finance, Budget Papers - Parts 1 and 2, 1969 (Ottawa: Queen's Printer), pp. 110, 117.

current and vital.

The results of this study should also be of interest to those who feel that the common stock of debtor firms appreciates at a greater rate than that of creditor firms during a period of rising price levels.

CHAPTER II

A SURVEY OF THE LITERATURE

The proposition that business firms gain real wealth as a result of inflation is encountered frequently in the literature of economics. Such gains are said to arise largely from some combination of the following set of circumstances:

a) business firms, historically regarded as debtors, gain wealth as a result of paying-off fixed dollar obligations with depreciated money;

b) during periods of rising prices, wages traditionally lag behind prices to the extent that wealth is redistributed from employees to the owners of business firms; and

c) inventories appreciate during periods of rising prices so that windfall profits result.

Recently, these views have been modified or cast into doubt by a number of economic researchers. The purpose of this chapter is first to briefly sketch the development of the thesis that business firms increase their com-

mand over real resources during periods of rising prices,
and second to describe some of the empirical work recently
performed to test the validity of hypotheses developed
from circumstances a) and b) above.

Historical Evidence Relating Inflation, Profits, Wages and Prices

Economists have long speculated upon the effects
of inflation on the economic welfare of business organ-
izations. Professor Earl J. Hamilton was probably the
most prolific writer on this topic. His "Presidential
Address to the Economic History Association"[1] was a com-
prehensive summary of historical evidence supporting the
argument that business firms were extraordinarily profit-
able in periods of rising prices.

John Maynard Keynes' work supported Hamilton's
thesis. He believed that as prices rise, profits also
rise due to both a decline in the real value of debts
and a rise in the value of inventories held by business
firms. Keynes argued,

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[1]E.J. Hamilton, "Prices as a Factor in Business
Growth", Journal of Economic History, XII, (1952),
pp. 325-349.

> When the value of money falls, it is
> evident that those persons who have engaged
> to pay fixed sums of money yearly out of the
> profits of active business must benefit,
> since their fixed money outgoings will bear
> a smaller proportion than formerly to their
> money turnover. This benefit persists not
> only during the transitional period of
> change, but also, so far as loans are con-
> cerned, when prices have settled down at
> their new and higher level . . . .
>
> . . . .
> But during the period of change, while
> prices are rising month by month, the business
> man has a further and greater source of wind-
> fall. . . If month after month his stock ap-
> preciates on his hands, he is always selling
> at a better price than he expected and securing
> a windfall profit. . .[1]

The contention that debtors have gained from

inflation because they discharged their debts with depre-

ciated money (the debtor-creditor hypothesis) must clear-

ly be true under the assumption that lenders have tradit-

ionally underestimated future increases in price levels.

Both Keynes and Fisher[2] believed business firms to be

debtors, and beneficiaries of inflation.

The argument that business firms gain wealth

during inflation because they hold inventories which in-

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[1] J.M. Keynes, A Tract on Monetary Reform, (London, 1923), p. 18.

[2] Fisher in The Purchasing Power of Money (New York, 1920), p. 59, said, ". . . the business man's profits will rise . . . because the rate of interest he has to pay will not adjust itself immediately . . . profits will rise faster than prices . . . he will find himself making greater pro-fits than usual . . ."

crease in value along with price levels, has been dis-
missed by contemporary economists as "purely an artifact
of original cost accounting".[1] That is, when an item in
inventory is valued at its original cost, and later sold
at a mark-up based on current cost, the apparent increase
in profit margin merely reflects a decrease in the pur-
chasing power of money, assuming the price increase pro-
portional to the rate of inflation.

Many economists, who have studied historical
business statistics, claim that there is still another
and more important reason why business firms benefit from
inflation. Hamilton, for instance, argued that rising
prices tended to outrun any compensating wage adjustments
so that the increased spread between labour costs and bus-
iness revenue greatly increased the wealth of employers
during many inflationary eras. In his words:

> This lag [the lag of wages behind prices]
> has benefited capitalists as a class at the
> expense of labourers as a class and awarded
> gains that dwarf into insignificance the pro-
> fits from inventory and from declines in the
> real value of debts.[2]

This wage-lag effect constitutes the foundation

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[1] R.A. Kessel, "Inflation-Caused Wealth Redistri-
bution: A Test of a Hypothesis", The American Economic
Review, LXVI, (March, 1956), p. 456.

[2] Hamilton, Prices As A Factor in Business Growth,
p. 327.

of his theory of industrial development. He states that high profits, when prices are rising and wages lagging, encourage investment and discourage savings. The continuing rise in prices penalizes any delay in investment and encourages borrowing in anticipation of even greater earnings. The incentive to plow back gains into additional capital equipment acts as a powerful stimulus to industrial development. Profit inflation, therefore, results in a much more rapid growth than would otherwise occur. Hamilton marshalled a large array of empirical support for his theory. This support was drawn primarily from European inflation experienced during the last four centuries.

Briefly, his arguments which he derived from studies of wage and price series, are as follows. During the sixteenth and seventeenth centuries the great inflow of wealth to Western Europe from the new world and the orient drove prices upward. At the same time wages lagged behind. The resulting ratio of prices to wages was highly favourable to new capital formation and eventually played a major role in the Industrial Revolution.

Hamilton has been severely criticized for basing his views on a mass of data whose reliability is open to

serious question. For instance David Felix contends that:

> Hamilton has misread the evidence, indust-
> rial profit inflation is not much in evidence
> in the period to which he refers. It is even
> possible that it was non-existent, although
> this may be too bold a counterclaim in view of
> the gaps and obscurities in the evidence . . .[1]

Felix reviewed Hamilton's work and the related historical data. He found no correlation between the degree of price inflation and profit inflation, or between the rate of profit inflation and the rate of industrial growth. Spain underwent the greatest price inflation and had the least profit inflation. France, with the least price inflation, had the greatest profit inflation. England, with less profit inflation than France, had a greater industrial growth. Felix concluded that price inflation was not synonymous with profit inflation, and a widening spread between wage and price indices did not necessarily mean a more rapid rate of growth.

Many other writers, particularly Alchian and Kessel[2], also questioned the credibility of a theory de-

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[1]D. Felix, "Profit Inflation and Industrial Growth: The Historic Record and Contemporary Analogies", Quarterly Journal of Economics, LXX, (1956), p. 442.

[2]A.A. Alchian and R.A. Kessel, "The Meaning and Validity of the Inflation - Induced Lag of Wages Behind Prices", The American Economic Review: L, (March, 1960), pp. 42-66.

rived from obscure historical data. They found that Hamilton's data failed in large part to support his thesis. For instance, he reported real wages lower in Spain in 1600 than they had been in 1520. Although mathematically correct, this did not indicate the trend he attempted to portray. Choice of the years 1602 and 1522 would have yielded a conflicting figure.

Unfortunately, neither wage-lag theorists nor their opponents have been able to establish the true historical relationship between real wages, prices and profits, while holding the effects of supply and demand, war and plague, etc., constant. The only conclusion to be drawn from the foregoing is that there is no concensus among economists as to whether or not business firms have traditionally benefited from inflation.

Recent Tests of the Debtor-Creditor and Wage-Lag Hypotheses

The debtor-creditor hypothesis

Kessel[1] empirically tested the following two implications of the debtor-creditor hypothesis: (a), the

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[1]Kessel, Inflation-Caused Wealth Redistribution, p. 457.

absolute change implication that debtors will gain and creditors lose vis-à-vis their pre-inflation wealth positions, and (b), the relative change implication that modest debtors will gain less than more extreme debtors and vice-versa for creditors.

In order to test the first implication he developed a classification for determining whether a firm is a debtor or creditor, i.e. whether or not a firm's monetary liabilities exceed its monetary assets. Monetary assets and liabilities are those balance sheet items whose values are independent of changes in price levels. He postulated that firms, which were net debtors, would show a greater mean change in wealth over an inflationary period than firms which were net creditors.

Kessel considered that confirmation of the first implication alone was not sufficient to support the hypothesis because the net monetary status of a firm could be merely a manifestation of the basic business philosophy of the firm, which in turn might be the real cause of different patterns of profitability over time. He considered that confirmation of the second implication, that more intense debtors would show a greater change in wealth position over a period of rising prices than less intense debtors, was essential to support the

hypothesis. To examine this second implication he de-
fined a measure of intensity of debtor status as the
ration of net monetary assets to total assets. The
larger the ratio the more extreme debtor status is con-
sidered to be, and conversely for creditors.

Kessel employed changes in common stock prices
of large American corporations, during both inflation
and deflation, as data reflecting changes in wealth of
these firms over time. He evaluated the predictive
content of the debtor-creditor hypothesis by comparing
hypothesized changes with observed changes, and evaluat-
ing the significance of the results.

Using three independent samples he found stat-
istically significant confirmation of both implications
over the inflationary period 1942 to 1948. In order to
evaluate the predictive content of the debtor-creditor
hypothesis over a period of deflation, he selected
another sample and tested it over the depression years
1929 to 1933. Again the results upheld the hypothesis.

Ando and Bach[1] analyzed the redistributional
effects of moderate American inflation over the period

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[1] G.L. Bach and Albert Ando, "The Redistributional
Effects of Inflation", Review of Economics and Statistics,
XXXIV, (1957), pp. 1-13.

1939 to 1952. The importance of net debtor or creditor position in explaining changes in the wealth of business firms was investigated using, as measures of performance, the change in common stock prices and the change in net return on investment. Their results did not uphold the debtor-creditor hypothesis. They concluded that either the rate of inflation was too moderate to allow the redistributional effects to be significantly felt, or that the effects were anticipated and effectively taken into account by the various economic groups concerned.

Ando and Bach also experimented with rank correlations relating improvement in performance to other balance-sheet and income-statement variables. They found that the closest associations lay between the increase in sales rank on the one hand and increases on net return on investment and stock prices on the other. They concluded that other factors, especially changes in sales volume, exercise more influence on changes in wealth than the debtor-creditor effect.

Alchian and Kessel[1] further investigated the debtor-creditor and wage-lag hypotheses using the same

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[1]A.A. Alchian and R.A. Kessel, "Redistribution of Wealth Through Inflation," Science, CXXX, (September, 1959), pp. 535-539.

concept of net debtor/creditor status as previously used
by Kessel and Bach. They changed Kessel's measure of in-
tensity of debtor/creditor status from the ratio of net
monetary assets to total assets to the ratio of net debtor
status to equity. Equity was defined as the value deter-
mined by multiplying the market price of common shares
times the shares outstanding. This change eliminated the
need to use accounting valuations of non-monetary assets.
As a measure of change in wealth, they again used ratios
of common stock prices at the end of the period to prices
at the beginning of the period.

They found that the distribution of firms by net
monetary status had changed from approximately 95% debtors
in 1914 to 50% debtors in 1952. This explained why Keynes
and Fisher made the assumption that business firms were
typically debtors. Alchian and Kessel found that firms
did not generally shift net monetary status from year to
year. They defined a firm to be a debtor firm for the
whole period if it maintained that status during 2/3 of
the period under study.

Statistically significant support for the debtor-
creditor hypothesis for all samples and all periods studied
was found during periods of both inflation and deflation.
They suggested that the debtor-creditor hypothesis was a

general theory of wealth transfer during inflation. However, they stated that this theory should in no way be construed as specific to business since it was equally applicable to an individual economic unit.

Louis De Alessi[1] tested the implication, which underlies the debtor-creditor hypothesis, that interest rates are biased estimates of the future course of prices when prices are rising because lenders underestimate the rate of inflation. He used a regression model to measure the extent of the bias in lenders' estimates of the future course of prices. Statistics on wholly-British-owned firms, covering the period 1949 to 1957, were used as data. The relative change in wealth less the rate of inflation was used as the dependent variable, and the ratio of net debtor status to equity, weighted by the rate of inflation, was used as the independent variable.

De Alessi ascribed his weak and inconclusive results to insufficient sample size considering the moderate rate of inflation experienced during the period studied. He did find statistically significant results substantiating the debtor-creditor hypothesis for the

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[1] De Alessi, Louis, "The Redistribution of Wealth By Inflation: An Empirical Test With United Kingdom Data", Southern Economic Journal, XXX, (1963-64), pp. 113-123.

years 1951-52 and 1955-57 when the rate of inflation was greatest. He concluded that his results tended to support the conclusions of Alchian and Kessel.

The wage-lag hypothesis

The wage-lag hypothesis rests on the proposition that inflation causes real wage rates to decline. Empirical evidence regarding this hypothesis is very difficult to come by. Although Kessel[1] did not specifically test the validity of this hypothesis, he felt that his data did bear some relevance. The debtor-creditor and the wage-lag hypotheses have conflicting implications for wealth changes in labour intensive creditor firms during both inflation and deflation, i.e. labour intensive creditor firms should lose during inflation through the debtor-creditor effect and gain through the wage-lag effect. Kessel found, as others had before him, that banks seemed to lose invariably during inflation and gain during deflation. This indicates that if a wage-lag effect was present, it was outweighed by the debtor-creditor effect. This is particularly relevant when one considers that banks are labour intensive[2] enterprises. Kessel concluded that there was considerable doubt

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[1]Kessel, Inflation - Caused Wealth Redistribution, p. 465.

[2]Ibid., (footnote 10), p. 457.

about any real wage-lag effect.

In an effort to bring some new evidence to bear on the wage-lag hypothesis, Alchian and Kessel[1] collected data on all New York Stock Exchange listed industrial firms reporting wage bills during the period 1940 to 1952. The proposition tested was that firms with large annual wage bills should gain wealth relative to firms with smaller annual wage bills. The results achieved were opposite to what the wage-lag hypothesis would predict.

In order to determine whether or not debtor-creditor effects were masking wage-lag effects, the relationship among:

net debtor status per dollar of equity,

annual wage bill per dollar of equity, and

yearly sales per dollar of equity

were further evaluated for the same firms by means of rank correlation analysis. Only net monetary status was found to be significantly correlated with relative stock price changes. They concluded that this evidence could be used to reject the wage-lag hypothesis.

In summary, most of the empirical work testing

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[1]Alchian and Kessel, Redistribution of Wealth Through Inflation, p. 539.

the debtor-creditor hypothesis tends to support the theory
that business firms gain real wealth during periods of ris-
ing prices under the assumptions that such firms are net
monetary debtors and that lenders do not correctly anticip-
ate rates of inflation. In the U.S.A., Alchian and Kessel
have shown that approximately 50% of large business firms
are net debtors so that one cannot say that U.S. firms as a
class are beneficiaries of inflation. This paper will assess
the percentage of Canadian firms that are debtors, and carry
out empirical tests of the debtor-creditor hypothesis using
Canadian data.

There has been little empirical work done with res-
pect to the wage-lag hypothesis, and what has been done tends
to cast it into doubt. Current opinion would support the op-
posite view that real wages are outstripping prices. Another
objective of this paper will be to determine whether Canadian
firms which are more labour intensive have shown greater
gains in real wealth position than firms which are less lab-
our-intensive during the recent inflationary experience. It
is further proposed to develop a model for simultaneously
testing the debtor-creditor and wage-lag hypotheses using
Canadian data over the period 1958 to 1969. This period is
characterized by a moderate rate of inflation from 1958 to
1964, followed by a steeper rate from 1965 to 1969. This
difference in rate between the two sub-periods should assist
in segregating the hypothesized effects from the effects of
other factors.

CHAPTER III

ALCHIAN AND KESSEL'S TESTS USING CANADIAN DATA

In this chapter the debtor-creditor and wage-lag hypotheses will be empirically tested independent of each other. The method of testing is patterned after the work of Alchian and Kessel[1]. They used United States data over the period 1915 to 1952. This study will employ Canadian data over the period 1958 to 1969. The debtor-creditor hypothesis will be tested in the first section, and the wage-lag hypothesis in the second.

The Debtor-Creditor Hypothesis

The debtor-creditor hypothesis, it will be re-called, states that inflation enables business firms to discharge their debts with depreciated money. Creditor's losses thus become debtor's gains. Two implications of this hypothesis will be tested in this chapter:

a) that debtor firms will gain wealth during in-

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[1]Alchian and Kessel, Redistribution of Wealth Through Inflation, pp. 535-539.

flation relative to creditor firms, and

b) that more intense debtors will gain greater
wealth than modest debtors.

The absolute implication

To test this implication it is necessary to clas-
sify firms according to their status as debtors or credit-
ors in terms of monetary assets and liabilities. The rel-
ative change in wealth for each firm in each group can be
calculated for the particular test period. These calcul-
ations will yield distributions of the changes in wealth
for each group, the means of which should be significantly
different from one another, with the debtor group showing
the greater increase.

The data required to test this implication are:

a) statistics to measure the wealth of a firm at
a given point in time,

b) statistics that will determine the net monetary
status of a firm.

The measure of wealth used is the value of the
firm's common stock as determined by the market. This can
be calculated by taking the average of the annual high and
low share prices and multiplying this average by the number
of shares outstanding. To the figure so calculated, div-
idends paid on common stock over the period would be added.

Such dividends are assumed reinvested for the remainder of the period at an annual return equivalent to the average annual yield on long term bonds.

To determine whether a firm is a net debtor or net creditor, monetary assets taken from the firm's balance sheet are subtracted from monetary liabilities. A positive balance indicates a firm to be a net debtor, and a negative balance indicates a net creditor. Cash, accounts receivable, bonds and prepaid taxes are examples of monetary assets; accounts payable, mortgages and bonds are examples of monetary liabilities.

Preferred stock is included as a monetary liability because it is, in substance if not legal form, a monetary obligation. This view is supported by Alchian and Kessel, as well as Guthman and Dougall[1].

"Investment in affiliates or non-consolidated subsidiaries", is a troublesome item with respect to classification. This account usually represents relatively permanent ownership in other corporations, and can be truly evaluated only by a detailed examination of the structure of such companies. Since time and resources do not permit such an investigation, this account will be

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[1]H.G. Guthman and H.E. Dougall, Corporate Financial Policy, 2nd ed., N.Y. (1948), p. 90.

regarded as neutral with respect to monetary status. An effort will be made to determine if the presence of firms with significant investments in affiliates is causing a bias in the test results.

The above income statement and balance sheet data is available, from the Financial Post Data Bank, on 255 companies operating in Canada[1].

<u>The statistical test</u> - The null hypothesis to be tested in this section is that debtor firms, as a group, do not differ from creditor firms in their wealth-generating capacity over a period of rising prices. The alternative hypothesis is that debtor firms generate more wealth than creditor firms during such a period.

A non-parametric test was chosen, over the parametric t test, to avoid making restrictive assumptions concerning the normality and variances of the population distributions underlying the samples. The Mann-Whitney U Test was chosen because it is ". . . one of the most powerful of the non-parametric tests and a most useful alternative to the t test. . ."[2]

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[1]For the period 1958 to 1967 the data is available on magnetic tape in the Computing Centre, The University of Alberta. Beyond 1967 it must be retrieved from file cards compiled by the same source in the same format.

[2]Sidney Siegel, <u>Nonparametric Statistics for the Behavioral Sciences</u>, McGraw-Hill Book Company, New York (1956), p. 116.

The test period - The entire test period covers the years 1958 to 1969. Because the available data yielded a very small sample of creditor firms over the entire period, the shorter period 1958 to 1968 was also used to enlarge the sample by including firms from whom data was not yet available for 1969. The sub-periods 1958 to 1964 and 1965 to 1969 were also used because, according to the General Wholesale Price Index, inflation was relatively more moderate over the first sub-period than over the second. The use of two such consecutive periods, characterized by relatively different rates of inflation, should help to detect the presence of debtor-creditor effects in the data.

The results - Debtor firms were found to make up approximately 83% of the sample as indicated in Table 3.1 below.

TABLE 3.1

PERCENTAGE OF DEBTORS AMONG ALL FIRMS SAMPLED
FOR THE PERIODS INDICATED

Period	No. of Debtors	No. of Firms Tested	Debtors as % of Total
1958-69	108	130	83.1
1958-68	137	165	83.0
1958-64	140	185	75.7
1965-68	197	232	84.9
1965-69	152	182	83.5

Alchian and Kessel found that debtor firms made up approximately 50% of all firms they tested in the U.S.A. in 1952. As indicated herein, debtor firms are much more predominant in Canada. This might possibly be due to the fact that Canada is relatively less developed than the U.S.A. and has a smaller stock of capital. Therefore it has to turn to foreign sources of capital, and finds debt funds easier to raise abroad than equity funds. In any case, if the debtor-creditor hypothesis is valid there would be justification for saying that Canadian business firms are generally beneficiaries of inflation.

Table 3.2 shows mean differences in wealth generating capacity for all debtor and creditor firms tested over the periods indicated. With the exception of the period of 1958 to 1964, when inflation was relatively moderate, creditor firms show a greater increase in wealth generated than debtor firms, in direct contradiction to the debtor-creditor hypothesis. For ease of computation, it was necessary to reverse the alternative hypothesis when creditor firms outperformed debtor firms, i.e. when creditor firms showed a greater change in wealth than debtor firms. The alternative hypothesis in that case is that the mean change in wealth was greater for creditor than debtor firms.

It is particularly significant to note that, as

TABLE 3.2

DEBTOR VERSUS CREDITOR PERFORMANCE:
ALL FIRMS STUDIED

	No. of Firms		Avge. Chge. in Wealth		Std. Dev.		Prob. of Type 1 Error
Period	Dr.	Cr.	Dr.	Cr.	Dr.	Cr.	
1958-69	108	22	2.78	3.53	2.71	3.75	.11
-68	137	28	2.57	2.58	3.50	2.18	.20
-64	140	45	1.67	1.55	1.21	1.00	.35
1965-68	197	35	1.63	2.39	1.67	1.74	.00
-69	152	30	1.86	2.82	1.86	2.10	.00

inflation became more severe during the period 1965 to 1969,
the differences between means became highly significant.
Creditor firms considerably outperformed debtor firms at a
significance level of .0003. This indicates that, as the
level of inflation increased, the performance of creditor
firms, as a group, increased relative to debtor firms.
The standard deviations shown indicate roughly that disper-
sion about the mean change in wealth is probably smaller
for creditor firms considering the sample sizes than for
debtor firms.

To counter the possibility that the results may

be biased by the fact that close to one-half of the firms
tested had significant investments in affiliates, whose
true monetary status was unknown, the tests were repeated
using only firms not having significant investments in
affiliates. The same general pattern emerged as is seen
in Table 3.3 below.

TABLE 3.3

DEBTOR VERSUS CREDITOR PERFORMANCE: FIRMS
WITHOUT INVESTMENTS IN AFFILIATES

	No. of Firms		Avge. Chge. in Wealth		Std. Dev.		Prob. of Type 1 Error
Period	Dr.	Cr.	Dr.	Cr.	Dr.	Cr.	
1958-69	62	6	2.47	4.87	1.80	6.57	.15
-68	81	8	2.26	3.06	2.31	3.02	.16
-64	83	17	1.63	1.60	1.01	1.35	.23
1965-68	121	15	1.55	2.74	1.45	1.80	.00
-69	91	14	2.04	2.93	2.25	1.88	.00

Comparison of Tables 3.2 and 3.3 shows that the
differences between the two groups are somewhat larger in
Table 3.3. This might be expected in view of the fact
that, as previously determined, Canadian business firms are
predominantly debtors. Including firms with investments in

affiliates in the sample would tend to understate the number of debtors since some of the firms classified as creditors might in fact be debtors considering the true monetary status of "investments in affiliates". This is further substantiated by referring to Table 1, Appendix 1, which displays the results of the same test for only firms with substantial investments in affiliates. Here debtor firms outperformed creditor firms over the periods 1958 to 1964, although the difference in performance is not significant. Creditor firms still outperformed debtor firms during the more inflationary period 1965 to 1969.

The firms were further categorized into 18 groups according to the classification scheme employed by the Toronto Stock Exchange. In most categories there were insufficient numbers of creditor firms to obtain meaningful results. The test results are displayed in Table 2, Appendix 1. In most cases, where sample sizes were sufficiently large to enable measures of significance to be obtained, creditor firms showed a better performance than debtor firms.

The above tests do not support the debtor-creditor hypothesis that debtor firms outperform creditor firms during periods of rising prices. On the other hand, these results show that over the periods studied, creditor firms almost consistently outperformed debtor firms, particularly

during the years when inflation was most severe.

The relative implication

This implication can be tested by computing the Spearman rank correlation between magnitude of change in wealth and intensity of debtor status for the firms sampled. If the relative implication holds, there should be a significant positive correlation between the two ranks. Intensity of debtor status can be had for each firm by obtaining the ratio of net monetary status to equity. This ratio allows comparisons to be made between firms of different sizes.

The null hypothesis to be tested is that no relationship exists between a firm's intensity of debtor status and its wealth-generating capacity over a period of rising price levels. The alternative hypothesis is that the more intense the debtor status of a firm, the more it will generate wealth during a period of rising prices.

Test results: firms with and without investments in affiliates. - Over the entire period of the study, 1958 to 1969, the correlation is positive as predicted by the hypothesis but very small and not significant for all firms grouped together. The same is true for the first sub-period, 1958 to 1964, when inflation was moderate. However, for the periods 1965 to 1968 and 1965 to 1969, when

inflation was most severe, the co-efficients are larger, negative and statistically significant at the .005 and .010 levels respectively. This is in direct contradiction to the debtor-creditor hypothesis. These results displayed below in Table 3.4 are consistent with the results of the tests of the absolute implication which also contradicted the debtor-creditor hypothesis.

When only debtor firms are considered (Table 3.4), the positive correlation is present and significant for the overall period and the first sub-period. For the periods 1965 to 1968 and 1965 to 1969, when the rate of inflation was greater, the sign is opposite to that hypothesized, but the coefficients are not significant. These findings indicate that debtor firms did behave as predicted by the hypothesis for the first three periods listed, but tended to depart from the predicted behaviour as inflation became more severe. When only creditor firms are considered (Table 3.4), the co-efficients are larger, negative and significant, in direct contradiction to the debtor-creditor hypothesis for all periods.

Only those firms with data also available for the period 1958 to 1964 were included in the samples for the periods 1965 to 1969, in Table 3.4. The sample size and reliability of the results in these last two periods can

TABLE 3.4

DEBTOR INTENSITY VERSUS CHANGES IN WEALTH: FIRMS WITH AND WITHOUT INVESTMENTS IN AFFILIATES

Period	No. of Firms	Spearman Rank Correlation (r_S)	Prob. of Type 1 Error

ALL FIRMS

Period	No. of Firms	Spearman Rank Correlation (r_S)	Prob. of Type 1 Error
1958-69	130	.0591	(no significance)
-68	165	.0635	(no significance)
-64	185	.0608	(no significance)
1965-68	127	* -.2417	.005
-69	127	* -.2229	.010

DEBTOR FIRMS ONLY

Period	No. of Firms	Spearman Rank Correlation (r_S)	Prob. of Type 1 Error
1958-69	108	.1938	.025
-68	138	.1787	.025
-64	153	.1175	.100
1965-68	105	* -.0603	(no significance)
-69	107	* -.0693	(no significance)

CREDITOR FIRMS ONLY

Period	No. of Firms	Spearman Rank Correlation (r_S)	Prob. of Type 1 Error
1958-69	22	-.3924	.050
-68	27	-.2808	.100
-64	32	-.3761	.025
1965-68	22	* -.3755	.050
-69	20	* -.3353	.100

* - includes only firms with data available for all periods

be increased by also including firms for whom data was unavailable in the earlier period. When this is done, the negative coefficients, for these latter two periods become significant for debtor firms as well as for creditor firms indicating that neither behaved according to the debtor-creditor hypothesis when inflation was greatest (see Table 3, Appendix 1).

Test results: only firms without investments in affiliates. - Since earlier tests indicated that a bias resulted from the inclusion of firms with investments in affiliates the tests were repeated excluding such firms from the sample. These results are portrayed in Table 3.5 below.

The coefficients are now larger and, except for creditor firms, indicate agreement with the debtor-creditor hypothesis during the overall period and the first sub-period. As in the earlier tests creditor firms show results contradictory to the hypothesis in both sub-periods although, because of reduced sample sizes, some of the correlation coefficients are not significant. The above results again suggest that the tests are biased by the inclusion of firms with investments in affiliates. When firms with investments in affiliates are included and such investments treated as neutral with respect to monetary status,

debtor status tends to be understated and creditor status overstated. This in turn distorts ranking by intensity of debtor status so that the correlation with ranked changes in wealth is reduced.

The reliability of the results for the sub-periods 1965 to 1968 and 1965 to 1969 can again be increased by including firms with data available only for these periods. The increased sample size makes the negative correlations for these periods significant for "All Firms" as may be seen in Table 4, Appendix 1. This further strengthens the conclusion that firms did not behave according to the debtor-creditor hypothesis during the period 1965 to 1969.

Test results: only firms with investments in affiliates. - When the tests are repeated on only those firms having significant investments in affiliates the previous results are corroborated although most of the co-efficients are not statistically significant (see Table 5, Appendix 1). When the samples for the 1965 to 1968 and 1965 to 1969 sub-periods are enlarged, as previously des-cribed, the results remain substantially the same although the negative coefficients do become significant for cred-itor firms. These results may be seen in Table 6, Appendix 1.

Test results: firms grouped by industry. - To evaluate the possibility that different industrial group-

TABLE 3.5

DEBTOR INTENSITY VERSUS CHANGES IN WEALTH: FIRMS WITHOUT INVESTMENTS IN AFFILIATES

Period	No. of Firms	Spearman Rank Correlation (r_s)	Prob. of Type 1 Error
ALL FIRMS			
1958-69	68	.2193	.05
-68	89	.1873	.05
-64	100	.1311	.10
1965-68	66	* -.1386	(no significance)
-69	66	* -.1395	(no significance)
DEBTOR FIRMS			
1959-69	62	.3270	.005
-68	81	.2904	.005
-64	89	.1739	.100
1965-68	58	* .1031	(no significance)
-69	58	* .0750	(no significance)
CREDITOR FIRMS			
1958-69	6	-.7143	(no significance)
-68	8	-.7619	.05
-64	11	-.6727	.025
1965-68	8	* -.8809	(no significance)
-69	8	* -.6429	(no significance)

* - Includes only firms with data available for all periods

ings might behave differently with respect to the debtor-creditor hypothesis the tests were repeated with the firms grouped in the eighteen categories used by the Toronto Stock Exchange. The results are tabulated in Table 7, Appendix 1. In most cases the results are statistically insignificant due to the small sample sizes. They do, however, indicate that some categories tend to behave as predicted by the debtor-creditor hypothesis while others do not. This suggests that in some areas of business endeavour the hypothesis may hold, while in others it may not. This would likely be a reflection of differences in capital structure and business risk faced by different groups.

In summary, the test results support neither the absolute nor the relative implications of the debtor-creditor hypothesis as a general theory of wealth transfer. The tests of the relative implication indicate that samples composed of only debtor firms did behave to some degree, in accordance with the hypothesis during the first sub-period studied, but all samples strongly contradicted the hypothesis during the latter sub-period when inflationary forces were strong.

This contradiction to the debtor-creditor hypothesis may in part be explained as a result of long term interest rates rising as fast as, or faster than, price levels during the latter part of the test period (see Chart 3.1). This

CHART 3.1

THE GENERAL WHOLESALE PRICE INDEX

AND LONG-TERM BOND YIELDS
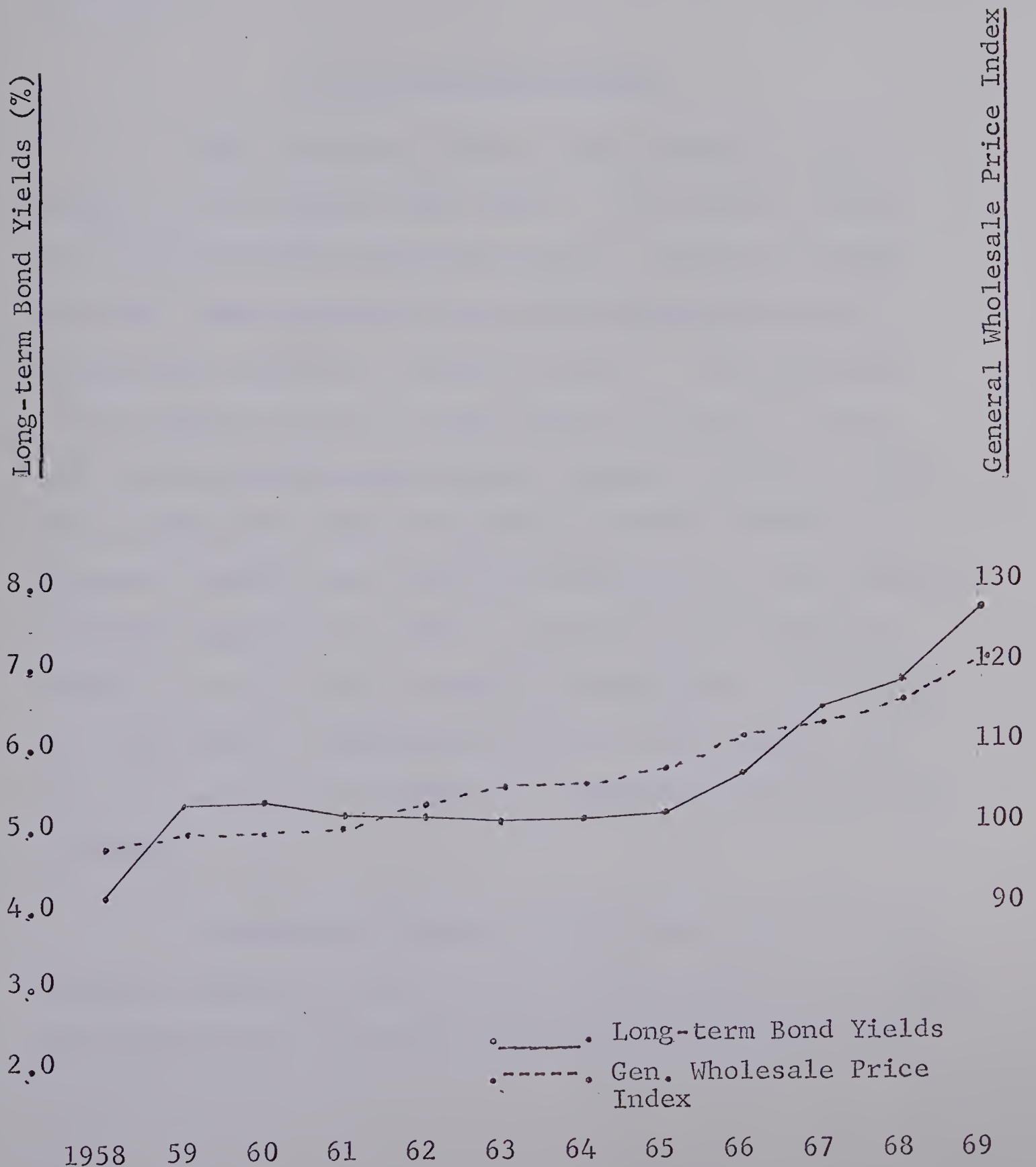
would adversely affect debtor firms who continually re-
place existing debt as it matures with new debt issues.
It would also appear that Canadian investors are "conserv-
ative" in that they prefer companies with modest debt in
their capital structures as opposed to heavily-levered
equities.

The Wage-Lag Hypothesis

This hypothesis states that inflation causes
prices to rise faster than wages. As a result workers
are systematically underpaid during a period of inflat-
ion with the consequent loss to the working class re-
presenting a gain for business owners. The implication
to be tested is that the more labour intensive a firm
the more it should gain during a period of rising prices.
This implication can be tested in a manner similar to
that for testing the "relative" implication of the debtor-
creditor hypothesis. That is, firms can be ranked by
change in wealth and by labour intensiveness. Should the
two ranks show a significant positive correlation, the
test can be used as evidence to support the wage-lag hy-
pothesis.

A measure of labour intensiveness can be deter-
mined by taking the ratio of the total wage bill to equity.
Wage data is not generally available in published form,

hence must be obtained from firms directly. The samples
to be tested in this section are therefore limited in size
to those companies responding to a request for the inform-
ation[1].

The null hypothesis tested is that more labour-in-
tensive firms do not differ from less labour-intensive firms
in their wealth-generating capacity. The alternative hypoth-
esis is that the more labour intensive a firm is, the more
wealth generating capacity it will have during a period of
rising price levels.

The results of the test are presented below in
Table 3.6.

TABLE 3.6

LABOUR INTENSITY VERSUS CHANGE IN WEALTH

Period	No. of Firms	Spearman Rank Correlation (r_S)	Prob. of Type 1 Error
1958-69	19	-.0509	(no significance)
-68	22	-.0209	(no significance)
-64	24	-.0739	(no significance)
1965-68	45	-.0918	(no significance)
-69	41	-.1291	(no significance)

[1]Each of the 255 companies listed in the Finan-
cial Post Data Bank was mailed requests for information
on wage data and hours of work. Copies of these requests
are included as Exhibits 1 and 2, Appendix 2.

The rank correlation coefficients are small and statistically insignificant for all samples and periods tested. In all cases the signs of the coefficients are opposite to what has been hypothesized by the wage-lag theory. These results tend to be in agreement with the contemporary view that wages have been outstripping prices.

The empirical results described in this chapter have contradicted both hypotheses. Creditor firms, as a group, have shown greater wealth-generating capacity than debtors. During the period of greatest inflation more intense debtors performed worse than less intense debtors. In all periods studied, more intense creditors have displayed greater wealth-generating capacity than less intense creditors. Similarly the evidence suggests that labour intensive firms have not performed as well as those that are less labour intensive.

It is possible that debtor-creditor and wage-lag effects tend to cancel each other to some extent. To counter this possibility the next chapter will be concerned with developing a method of testing for both effects sim-ultaneously while separating them from the influences of other causal factors.

CHAPTER IV

A REGRESSION MODEL FOR TESTING THE DEBTOR-CREDITOR
AND WAGE-LAG HYPOTHESES

The primary purpose of this chapter is to develop an operational model for simultaneously testing both the debtor-creditor and wage-lag hypotheses by means of regression and correlation. The model will incorporate a variable designed to isolate the effect of all other systematic causal variables on the wealth of the firm from debtor-creditor and wage-lag effects[1].

De Alessi's Model

This model was built to test the underlying implication of the debtor-creditor hypothesis that interest rates are biased estimates of the future course of prices when prices are rising. The development of his model, which follows, provides a firm conceptual base upon which an expanded model, which includes other explanatory variables, can be built.

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[1]Ando and Bach in The Redistributional Effects of Inflation found in their investigations that, of all variables tested, increased sales volume was the most influential factor determining a change in wealth. They found it to be much more explanatory than either the debtor-creditor or the wage-lag effect.

De Alessi used Kessel's classification system, discussed in Chapter III, for determining the net monetary status of a firm at a given point in time, say time (t). That is, net monetary position, M, was defined as the difference between monetary liabilities, ML, and monetary assets, MA, so that:

(1)
$$M_t = ML_t - MA_t$$

He further defined "real" or non-monetary assets and liabilities to be those whose value can be expected to change with changes in price levels. Examples of non-monetary assets would be land, buildings and inventories. Depreciation, repairs and maintenance would be examples of non-monetary liabilities. Therefore, the net non-monetary position of a firm, at a point in time (t), is given by:

(2)
$$R_t = NMA_t - NML_t$$

where R represents net non-monetary status, NMA represents non-monetary assets and NML represents non-monetary liabilities.

By categorizing all assets and liabilities of a firm into the classes thus described, the wealth of a firm, W, at a point in time, can be defined as the value of the firm's net non-monetary assets less the value of

its net monetary liabilities:

(3)
$$W_t = R_t - M_t$$

Consider changes in the wealth of a firm over a given time period. Ruling out all other wealth-affecting phenomena, net non-monetary assets should grow at the "real" rate of interest r, and net monetary liabilities should grow at the "money" rate of interest m, the rate specified in loan agreements, that is:

(4)
$$W_{t-1} = (1+r) \ R_t - (1+m) \ M_t$$

Inflation is defined, in this study, as an increase in relevant price levels regardless of cause. Ruling out all wealth affecting phenomena other than "normal" income as indicated in (4), a rate of inflation $= K_1$, means that the individual prices of goods and services increase at the rate K_1. Then the stream of income attributable to non-monetary assets R, must also increase at the rate K_1, so that, in terms of current prices, R would grow at the rate $(1+r+K_1)$.

The net stream of outlays resulting from holding monetary obligations (M>0), is fixed at the contractually agreed-upon rate of interest m. However, when lenders fixed the rate m, they set it with their expectations of future price levels in mind. If Ka was the anticipated

rate of inflation, then a lender would have determined
the lending rate to be $(r-Ka) = m$. Thus, monetary liab-
ilities would grow at the rate $(1-r-Ka)$. Therefore:

(5)
$$W_{t+1} = (1+r+K_1)_{t+1} \, R_t - (1+r+Ka)_t \, M_t$$

from (3),
$$R_t = W_t + M_t$$

substituting this into (5), we obtain:

$$W_{t+1} = (1+r+K_1)_{t+1} \left[W_t + M_t \right] - (1+r+Ka)_t \, M_t$$

(6)
$$\text{or,} \quad W_t = (1+r+K_1)_{t+1} \, W_t + (K_{1_{t+1}} - Ka) \, M_t$$

Hence, under the conditions so far specified,
wealth of the firm at time $(t+1)$ would be equal to wealth
at time (t) multiplied by the sum of the normal rate of re-
turn and the rate of inflation, plus the change in wealth
due to net monetary position given by $(K_{1_{t+1}} - Ka) \, M_t$.

If the actual rate of inflation, K_1, is greater
than the rate of inflation anticipated at the time of debt
creation, Ka, the firm will gain wealth on its monetary
liabilities and lose wealth on its monetary assets at the
rate $(K_{1_{t+1}} - Ka)$.

If the degree to which inflation is correctly
anticipated is represented by $\dfrac{K_1 - Ka}{K_1} = B_1$,
then B_1 can be substituted into (6), so that it becomes:

$$(7) \quad W_{t+1} = (1+r+K_1)_{t+1} \; W_t + B_1 K_{1t+1} M_t$$

If $B_1 = 0$, lenders correctly anticipated the rate of inflation and there can be no gain resulting from paying off the debt with depreciated money. If $B_1 = 1$, inflation was wholly unanticipated and debtors will realize a windfall gain in the amount $K_1 M_t$.

Expansion of the Basic Model

Incorporation of the wage-lag effect

Up to this point, the model has essentially been that of De Alessi. A departure from his model is now required in order to incorporate further explanatory variables.

Assume all things constant except the cost of living, measured in this case by K_2, the consumer price index. If labour is to maintain its current share then wages must be adjusted over any period of time to reflect this increase in the cost of living.

Let $C(t) =$ the wage rate in effect during the time period (t)

Let $H(t) =$ the hours worked during the time period (t)

If wages were not properly adjusted to reflect the increased cost of living during the period $(t+1)$, then labour would

have income appropriated away from it in the amount

$$K_{2_{t+1}} \quad C_t \; H_{t+1}, \text{ during the period } (t+1).$$

It is quite common, today, to hear statements to the effect that labour is irresponsible in seeking wage increases greater than productivity increases. This implies that labour is not unreasonable in seeking wage-rate increases proportional to the increase in the productivity of labour. Therefore wages should be adjusted upward by an amount equal to $P_{t+1} \; C_t \; H_{t+1}$, where P represents the increase in the index of the productivity of labour.

Let $\triangle C$ represent the actual increase in wage-rates that took place between times (t) and (t+1). If the adjustment in wage rates is less than it should be, owners will gain at the expense of the labour they employ in the amount

$$(P+K_2)_{t+1} \quad C_t \; H_{t+1} \quad - \triangle C \quad C_t \; H_{t+1}$$

or, $\left[(P+K_2)_{t+1} - \triangle C \right] C_t \; H_{t+1}$

Equation (7) can now be expanded as follows:

$$(8) \qquad W_{t+1} = (1+r+K_1)_{t+1} \; W_t + B_1 \left[K_{1_{t+1}} M_t \right]$$

$$+ B_2 \left[(P+K_2)_{t+1} - \triangle C \right] C_t \; H_{t+1}$$

The coefficient, B_2, can now be looked upon as a measure of the degree to which a wage-lag, if present, will affect the wealth of the firm. If B_2 is equal to zero, there is no wage-lag effect operating on the wealth of the firm. If there is a wage-lag effect operating, the wealth of the firm will be affected in accordance with the magnitude and direction of the effect. If B_2 is positive, owners will gain at the expense of the labour they employ, if negative, labour will be obtaining a greater share of the wealth generated than warranted by increases in the productivity of labour and the cost of living.

Incorporating changes in sales volume

Suppose that the firm is growing in the sense that it is expanding output in terms of constant sales dollars, S. The increased real revenue will be offset to a certain extent by increased operating and selling expenses, OE. Therefore the increase in wealth attributable to the increased sales volume will be equal to

$$\triangle S \ - \triangle OE.$$

In the present context, this sales variable can be looked upon as incorporating the influence of other factors that are likely to cause a change in the wealth of a firm. For instance, the ability to seek out and

exploit further sales opportunities as well as the ability to hold down operating and selling expenses is indicitive of managerial efficiency in the acquisition and use of production and distribution facilities.

Let the degree of exploitation of added sales opportunities, which includes the influence of all other causal factors, be

$$\frac{\triangle S - \triangle OE}{\triangle S} = B_3$$

Therefore the total gain in wealth attributable to the real change in sales volume is $B_3 \triangle S$.

But, the term $B_3 \triangle S$ will have embodied within it any gain that resulted from a wage-lag effect. Hence the amount $\left[(P+K_2)_{t+1} - \triangle C \right] C_t H_{t+1}$ must be subtracted from $\triangle S$ to represent the gain in wealth solely attributable to the real change in sales volume. Therefore, equation (8) can be expanded to become:

(9)
$$W_{t+1} = (1+r+K_1)_{t+1} \ W_t + B_1 \left[K1_{t+1} M_t \right]$$

$$+ B_2 \left[(P+K_2)_{t+1} - \triangle C \right] C_t H_{t+1}$$

$$+ B_3 \left[\triangle S - \left[(P+K_2)_{t+1} - \triangle C \right] C_t H_{t+1} \right]$$

To complete the equation, it is necessary to in-

clude the random error term u. This term is expected to
account for the many factors missing in the regression
equation, which, even if they were all known and quanti-
fiable, would be impractical to include. It is also ex-
pected to account for the errors of observation and
measurement which are bound to accompany the use of ac-
counting information subject as it is to the inconsist-
encies of broadly-defined "generally acceptable accounting
procedures". The error term should be normally distri-
buted with a finite variance and a mean expected value of
zero. The final regression model is represented by equa-
tion (10) below.

(10)

$$W_{t+1} = (1+r+K_1)_{t+1} \; W_t \; + \; B_1 \left[K_{1_{t+1}} M_t \right]$$

$$+ \; B_2 \left[(P+K_2)_{t+1} \; - \; \triangle c \right] \; C_t H_{t+1}$$

$$+ \; B_3 \left[\triangle s - \left[(P+K_2)_{t+1} - \triangle c \right] \right.$$

$$\left. C_t H_{t+1} \right] + \; u$$

The regression equation

The relative change in wealth over the discrete
time period from (t) to (t+1), when rates of return are
not compounded, can be approximated by:

(11)

$$\frac{W_{t+1}}{W_t} = (1+r+K_1)_{t+1} + B_1 \left[\frac{K_1 M_t}{W_t} \right]$$

$$+ B_2 \left[\frac{\left[(P+K_2)_{t+1} - \triangle C \right] C_t H_{t+1}}{W_t} \right]$$

$$+ B_3 \left[\frac{\triangle S - \left[(P+K_2)_{t+1} - \triangle C \right] C_t H_{t+1}}{W_t} \right] + u$$

The dependent variable represents the change in wealth of the firm over the time period from (t) to (t+1). The constant term represents the normal rate of return on physical assets accruing to all firms over the same time period.

The first independent variable, with coefficient B_1, represents the ratio of net monetary position to equity weighted by the rate of inflation. The hypothesis that the full increase in the rate of inflation is not correctly anticipated at time (t) implies that, for any given rate of inflation, the greater the ratio of net monetary position to equity, the greater the relative increase in wealth due to inflation. This study will evaluate the null hypothesis that $B_1 = 0$.

The second independent variable, with coefficient B_2, is the ratio of the maximum gain that can accrue to the firm as a result of a wage-lag to equity. The hypothesis that there is a positive wage-lag implies that the great-

er this ratio, the greater the increase in wealth due to the wage-lag effect. The null hypothesis to be evaluated is that $B_2 = 0$.

The third independent variable, with coefficient B_3, represents the ratio of the maximum gain in wealth attributable to expanded sales volume, to equity. The hypothesis that expanded sales opportunities are profitably exploited implies that the greater this ratio, the greater the effect on the wealth position of the firm. This variable is included to help isolate debtor and creditor effects on the wealth of the firm from other causal factors.

CHAPTER V

ANALYSIS OF REGRESSION RESULTS

The purpose of this chapter is first to describe the data requirements for testing the regression model developed in Chapter IV and second, to evaluate the results of the test in order to determine the influence of inflation upon the profitability of the firms sampled.

Data Requirements

In order to test the model, measures of the following data items are required for each time period:

a) the wealth of the firm

b) the monetary status of the firm

c) sales figures for each firm

d) appropriate measures of the rate of inflation

e) annual changes in the productivity of labour

f) the number of labour units used by firm

g) wage-rates paid by firm.

Sales figures by firm are available from the data

bank which yielded estimates of wealth and monetary status for the tests in Chapter III. Measures of inflation are readily available from regular publications of the Dominion Bureau of Statistics.

A measure of the increase in productivity is also available from the Dominion Bureau of Statistics. The appropriate productivity measure is an economy-wide one, rather than a measure for each individual firm. This view is strongly supported by economists such as Fritz Machlup[1] who wrote:

> ... The "rule" that price stability and full employment can be maintained if all money wage rates are increased by the same percentage by which average productivity has increased in the economy as a whole is frequently misunderstood and mistakenly applied to advocate increases in money-wage rates in individual firms or industries by the same percentage by which productivity has increased in these firms or industries. In other words, the rule is perverted to the proposal that the benefits of advancing productivity should accrue to the worker in the industries in which the advances take place...

> ... A sensible allocation of resources requires that the same factors of production are offered at the same prices to all industries. It causes misallocations if industries in which technology has improved are forced to pay higher wages for the same type of labour that gets lower pay in industries where technology has not changed...[2]

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[1] Fritz Machlup, "Another View of Cost-Push and Demand-Pull Inflation", The Review of Economics and Statistics, XLII, (May, 1960), p. 134.

[2] Ibid., p. 134.

Measures of labour units used and wage rates paid are generally unavailable in published form on a firm by firm basis.

As previously explained in Chapter III, this information must be obtained directly from the individual firm so the sample size is limited to those firms who responded to the request for information and to those who publish it in their annual reports.

The data was retrieved from the sources listed above and used with the model to conduct the tests described in the following section.

Test Results

The parameters of the regression equations were estimated each year for the overall period 1958 to 1969.[1] The null hypothesis tested was that the coefficients of the independent variables were not significantly different from zero. The alternative hypotheses are:

   a) that there is statistically significant support for the debtor-creditor hypothesis if the coefficient of the first independent

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[1]The regressions were calculated using the multiple regression and correlation functions in K.W. Smillie, Statpack 2: An APL Statistical Package, 2nd ed., Publication No. 17, Department of Computing Science, University of Alberta, Edmonton, Alberta.

variable is greater than zero. The opposite will be concluded if the coefficient is less than zero.

b) that there is statistically significant support for the wage-lag hypothesis if the coefficient of the second independent variable is positive. If it is negative the opposite will be concluded.

The third independent variable has been included to help isolate the influence of inflation on the wealth of the firm from other causal factors. Increases or decreases in sales reflect the influence of such internal factors as managerial efficiency and financial strength, hence should play a significant role in explaining wealth changes emanating from actions under the control of the firm. Determining and explaining the effect of changes in sales volume is not an objective of this thesis.

The debtor-creditor effect

The regression equations yielded the estimates shown in Table 5.1 below concerning the debtor-creditor effect.

The standard errors of the regression coeffic-

TABLE 5.1

ESTIMATES AND SIGNIFICANCE OF THE REGRESSION COEFFICIENT
OF THE INDEPENDENT VARIABLE REPRESENTING
THE DEBTOR-CREDITOR EFFECT

Period	No. of Firms	Regression Coefficient (b)	Std. Error of b	95% Confidence Interval for b
1958-59	16	-12.7	17.3	$-50.4 \leq b \leq 25.1$
1959-60	18	211	166	$-145 \leq b \leq 568$
1960-61	24	10.6	10.5	$-11.4 \leq b \leq 32.5$
1961-62	25	3.04	2.61	$-2.39 \leq b \leq 8.46$
1962-63	28	5.26	8.48	$-12.2 \leq b \leq 22.7$
1963-64	27	-18.9	39.1	$-99.8 \leq b \leq 62.0$
1964-65	33	-3.22	3.83	$-11.1 \leq b \leq 4.62$
1965-66	40	3.33	2.55	$-1.87 \leq b \leq 8.53$
1966-67	41	-6.17	4.97	$-16.3 \leq b \leq 3.98$
1967-68	42	-3.64	2.38	$-4.52 \leq b \leq 5.20$
1968-69	41	-0.066	1.04	$-2.18 \leq b \leq 2.05$

ients are very large and in all cases indicate that the
coefficients are not significantly different than zero.
95% confidence limits indicate, in all cases, that the
true value of the regression coefficient could be posi-
tive or negative. These results clearly indicate accept-
ance of the null hypothesis, i.e. the results clearly
show a lack of support for the debtor-creditor hypothesis

consistent with the results achieved in Chapter III.

The fact that the standard errors of the co-
efficients are, in most cases, greater than the coef-
ficients themselves demonstrates a lack of regression
between changes in wealth and the debtor-creditor ef-
fect. This lack of regression can be readily seen by
referring to Chart 1, Appendix 3. As shown by the
scatter of points, small errors of measurement or changes
in sample size could easily tilt the fitted line in
either direction. This chart also serves as a check on
linearity and homoscedasticity. There is no observable
non-linear trend in the data and the points show a reas-
onably uniform scatter about the regression line.

The wage-lag effect

The results of the regression analysis relevant
to the wage-lag effect are tabulated below in Table 5.2.

With the exception of two periods, each of which
is indicated by an asterisk in the table below, the co-
efficients are not significantly different from zero. In
both exceptions the signs are negative in direct contra-
diction to the wage-lag hypothesis. These results indicate
acceptance of the null hypothesis and rejection of the
debtor-creditor hypothesis. This is consistent with the

results achieved by rank correlation in Chapter III.
The regression line and data points are illustrated
in Chart 2, Appendix 3. This chart indicates the same
lack of regression noted under the wage-lag effect and
does not indicate any non-linear trend or lack of homo-
scedasticity.

TABLE 5.2

ESTIMATES AND SIGNIFICANCE OF THE REGRESSION COEFFICIENT
OF THE INDEPENDENT VARIABLE REPRESENTING
THE WAGE-LAG EFFECT

Period	No. of Firms	Regression Coefficient (b)	Std. Error of b	95% Confidence Interval for b
1958-59	16	* −11.8	4.08	−20.7 ≤ b ≤ −2.91
1959-60	18	0.13	2.13	−4.43 ≤ b ≤ 4.69
1960-61	24	0.30	1.15	−2.09 ≤ b ≤ 2.69
1961-62	25	7.74	4.66	−1.98 ≤ b ≤ 17.4
1962-63	28	6.54	6.97	−7.85 ≤ b ≤ 20.9
1963-64	27	0.29	2.93	−5.77 ≤ b ≤ 6.35
1964-65	33	2.74	1.97	−1.29 ≤ b ≤ 6.77
1965-66	40	* −7.62	3.37	−14.5 ≤ b ≤ −0.74
1966-67	41	1.32	1.56	−1.87 ≤ b ≤ 4.50
1967-68	42	−0.15	0.764	−11.3 ≤ b ≤ 20.0
1968-69	41	−1.48	1.79	−5.13 ≤ b ≤ 2.17

* Indicates that the coefficients are significant at
  the .05 level.

The effect of a change sales volume

The regression results pertinent to changes in sales volume are displayed below in Table 5.3.

TABLE 5.3

ESTIMATES AND SIGNIFICANCE OF THE REGRESSION COEFFICIENT
OF THE INDEPENDENT VARIABLE REPRESENTING
CHANGES IN SALES VOLUME

Period	No. of Firms	Regression Coefficient (b)	Std. Error of b	95% Confidence Interval for b
1958-59	16	* 0.846	0.338	$0.110 \leq b \leq 1.58$
1959-60	18	1.39	1.02	$-0.796 \leq b \leq 3.59$
1960-61	24	* 1.22	0.138	$0.936 \leq b \leq 1.512$
1961-62	25	0.285	0.302	$-0.343 \leq b \leq 0.913$
1962-63	28	0.230	0.389	$-0.573 \leq b \leq 1.033$
1963-64	27	0.616	0.510	$-0.439 \leq b \leq 1.67$
1964-65	33	0.305	0.186	$-0.075 \leq b \leq 0.685$
1965-66	40	* 0.486	0.187	$0.104 \leq b \leq 0.868$
1966-67	41	0.429	0.496	$-0.447 \leq b \leq 1.31$
1967-68	42	* 0.684	0.198	$0.279 \leq b \leq 1.089$
1968-69	41	* 0.641	0.270	$0.089 \leq b \leq 1.19$

* Indicates that the coefficient is significant at the .05 level.

In five of the eleven periods studied, the change in sales volume had a significant positive effect on the wealth

of the firm. In all eleven periods the coefficients are
positive and consistent in size. These results tend to
corroborate the work of Ando and Bach[1], who found that
debtor-creditor and wage-lag effects played a minor role
in determining changes in the wealth of firms while changes
in sales volume were significant.

The fact that changes in sales volume were not
significant in six periods is likely explained by the ef-
fect of external influences not subject to managerial con-
trol. For instance fluctuations in the stock market would
certainly influence wealth as would changes in government
policy (i.e., fiscal, monetary, foreign, etc.).

The regression line and data points are illustrated
in Chart 3, Appendix 3. Again a lack of regression is demon-
strated. There is no observable non-linear trend or lack of
homoscedasticity.

Correlation between the independent variables

The statistical insignificance of the variables rep-
resenting the debtor-creditor and wage-lag effects, accomp-
anied as they are by high standard errors suggest the possib-
ility of collinearity between the independent variables. In

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[1]Ando and Bach, Redistributional Effects of Inflat-
ion, p. 11.

order to demonstrate that collinearity is not a problem in this study, the correlation matrix between the independent variables is displayed below in Table 5.4.

TABLE 5.4

CORRELATION MATRIX OF THE INDEPENDENT VARIABLES

Period	*Variable 2 with 3	*Variable 2 with 4	*Variable 3 with 4	R^2
1958-59	-.435	.160	-.172	.593
1959-60	-.108	.086	-.250	.217
1960-61	-.024	.157	-.315	.821
1961-62	-.482	-.126	-.145	.131
1962-63	-.387	-.312	.087	.048
1963-64	.339	-.183	-.124	.079
1964-65	-.191	.263	-.042	.151
1965-66	.866	.142	-.366	.191
1966-67	-.174	.196	.237	.090
1967-68	.004	.176	-.431	.301
1968-69	-.272	-.180	.512	.137

* Variable two represents the debtor-creditor effect, variable three the wage-lag effect and variable four the effect of a change in sales volume.

The small correlation coefficients indicate that collinearity is not obscuring the relationships between the

dependent and independent variables. The coefficients of multiple determination are small and, consistent with the findings relevant to the partial regression coefficients, indicate that the independent variables explain very little of the variation in the dependent variable.

In summary, the tests performed in this chapter indicate that neither the debtor-creditor nor wage-lag effects have significantly influenced the performance of firms. These results suggest that the redistributional effects of inflation are weak or non-existent during the inflationary experience of the past decade. This can result from anticipation of the results of inflation by various economic groups, so that lenders do not underestimate the future rise in price levels and unions, during wage negotiations, bargain for wages that completely offset rising price levels.

CHAPTER VI

SUMMARY AND CONCLUSIONS

The primary objectives of this study were: (1) to determine if Canadian business firms gain real wealth during inflation by means of the debtor-creditor effect, and (2) to likewise determine if firms have benefited through a wage-lag effect.

To attain these objectives, available balance sheet, income statement, and wage data were gathered on 255 companies doing business in Canada over the years 1958 to 1969. The data was used to classify firms as debtors or creditors and to measure the intensity of their debtor or creditor status relative to one another. The data was further used to calculate the change in wealth of each firm over the period of study. By this means, the relationship between debtor/creditor status and changes in wealth for various samples of firms was estimated. The results were compared to what the debtor-creditor and wage-lag hypotheses would predict in order to assess the validity of these hypotheses. Nonparametric statistical techniques were used to evaluate the significance of the differences between the observed and

predicted relationships.

In addition to these tests, a regression model designed to test simultaneously the debtor-creditor and wage-lag effects was developed and used with the same data. This regression model included another explanatory variable whose function was to keep the debtor-creditor and wage-lag effects isolated from other causal factors under the control of the firm.

The nonparametric tests showed that creditor firms substantially outperformed debtor firms throughout the period 1958 to 1969 in contradiction to the debtor-creditor hypothesis. The difference between performances was greatest during the latter years of the study when inflation was strongest. The tests also showed a significant inverse correlation between intensity of debtor status and change in wealth over the latter half of the period. The results deny the validity of the debtor-creditor theory. There was a small negative correlation found between labour-intensity and changes in wealth. The correlation coefficient was not statistically significant, but did indicate rejection of the wage-lag theory.

The regression model showed that neither debtor-creditor nor wage-lag effects were significant determinants of changes in wealth for the firms studied over the period

1958 to 1969. These results reinforced those obtained by the nonparametric methods.

In conclusion, the results of this study clearly indicate that Canadian business firms have not benefited from the recent inflationary experience through either the debtor-creditor or the wage-lag effects. It is probable that the redistributional effects were correctly anticipated by the various economic groups involved. This would allow lenders, business men and union leaders to effectively account for and offset the redistributional effects of inflation during the negotiation of interest and wage rates, and during the setting of prices.

The theory that the common stock of debtor firms appreciates at a greater rate than that of creditor firms during inflation is strongly contradicted by the results of this study. Creditor firms have significantly outperformed debtor firms over the study period. The study suggests that Canadian investors are "conservative" in that they prefer stocks with little or moderate debt to heavily-levered stocks.

This study rejects the debtor-creditor and wage-lag hypotheses as general theories of wealth transfer during inflation. In Canada, business firms have not been beneficiaries of the current inflation through either of these two effects.

APPENDIX I

TABLE 1, APPENDIX I

DEBTOR VERSUS CREDITOR PERFORMANCE
ONLY FIRMS WITH INVESTMENT IN AFFILIATES

Period	No. of Firms		Avge. Chge. in Wealth		Std. Dev.		Prob. of Type 1 Error
	Dr.	Cr.	Dr.	Cr.	Dr.	Cr.	
1959-69	46	16	3.20	3.02	3.58	2.07	.26
-68	56	20	3.02	2.39	4.71	1.81	.47
-64	57	28	1.73	1.53	1.46	0.73	.39
1965-68	76	20	1.76	2.12	1.96	1.69	.05
-69	61	16	1.61	2.73	0.97	2.33	.02

TABLE 2, APPENDIX I

DEBTOR VERSUS CREDITOR PERFORMANCE

Period	No. of Firms		Avge. Chge. in Wealth		Std. Dev.		Prob. of Type 1 Error
	Dr.	Cr.	Dr.	Cr.	Dr.	Cr.	
Group 1: Beverages							
1959-69	2	3	3.07	7.50	1.67	9.32	.29
-68	7	3	5.24	4.64	8.21	4.79	.33
-64	8	3	1.78	2.88	0.91	2.69	.32
1965-68	8	3	2.23	1.50	3.34	0.34	.25
-69	3	3	0.93	2.10	0.46	0.89	.10

TABLE 2, -Continued

DEBTOR VERSUS CREDITOR PERFORMANCE

Period	No. of Firms Dr.	Cr.	Avge. Chge. in Wealth Dr.	Cr.	Std. Dev. Dr.	Cr.	Prob. of Type 1 Error

Group 2: Food Processing

Period	Dr.	Cr.	Dr.	Cr.	Dr.	Cr.	Prob. of Type 1 Error
1959-69	-	nil	-	-	-	-	-
-68	-	nil	-	-	-	-	-
-64	17	1	1.43	1.00	0.81	-	-
1965-68	20	1	1.14	6.18	0.36	-	.05
-69	-	nil	-	-	-	-	-

Group 3: Merchandising

Period	Dr.	Cr.	Dr.	Cr.	Dr.	Cr.	Prob. of Type 1 Error
1959-69	9	2	2.42	1.14	1.08	0.33	.05
-68	15	2	1.59	1.11	0.80	0.50	.05
-64	17	2	1.21	0.91	0.75	0.03	.05
1965-68	20	2	1.58	1.14	1.19	0.61	.32
-69	12	1	2.05	0.90	1.36	-	-

Group 4: Communications

Period	Dr.	Cr.	Dr.	Cr.	Dr.	Cr.	Prob. of Type 1 Error
1959-69	1	1	1.53	4.59	-	-	-
-68	1	1	1.26	4.01	-	-	-
-64	1	1	0.72	2.40	-	-	-
1965-68	1	2	1.79	3.93	-	3.08	-
-69	1	2	2.22	3.90	-	2.60	-

TABLE 2, -Continued

DEBTOR VERSUS CREDITOR PERFORMANCE

Period	No. of Firms Dr.	Cr.	Avge. Chge. in Wealth Dr.	Cr.	Std. Dev. Dr.	Cr.	Prob. of Type 1 Error

Group 5: Utilities

Period	Dr.	Cr.	Dr.	Cr.	Dr.	Cr.	Prob.
1959-69	-	nil	-	-	-	-	-
-68	-	nil	-	-	-	-	-
-64	-	nil	-	-	-	-	-
1965-68	15	1	1.51	5.79	0.68	-	-
-69	15	1	1.70	8.24	0.79	-	-

Group 6: Transportation

Period	Dr.	Cr.	Dr.	Cr.	Dr.	Cr.	Prob.
1959-69	-	nil	-	-	-	-	-
-68	-	nil	-	-	-	-	-
-64	2	1	1.28	1.65	0.30	-	-
1965-68	-	nil	-	-	-	-	-
-69	-	nil	-	-	-	-	-

Group 7: Pipelines

Period	Dr.	Cr.	Dr.	Cr.	Dr.	Cr.	Prob.
1959-69	-	nil	-	-	-	-	-
-68	-	nil	-	-	-	-	-
-64	-	nil	-	-	-	-	-
1965-68	-	nil	-	-	-	-	-
-69	-	nil	-	-	-	-	-

TABLE 2, -Continued

DEBTOR VERSUS CREDITOR PERFORMANCE

Period	No. of Firms		Avge. Chge. in Wealth		Std. Dev.		Prob. of Type 1 Error
	Dr.	Cr.	Dr.	Cr.	Dr.	Cr.	

Group 8: Chemicals

Period	Dr.	Cr.	Dr.	Cr.	Dr.	Cr.	
1959-69	-	nil	-	-	-	-	-
-68	-	nil	-	-	-	-	-
-64	-	nil	-	-	-	-	-
1965-68	8	1	1.58	0.90	1.90	-	.33
-69	7	1	1.80	0.96	1.29	-	.50

Group 9: Oil Refining

Period	Dr.	Cr.	Dr.	Cr.	Dr.	Cr.	
1959-69	-	nil	-	-	-	-	-
-68	13	1	5.66	2.77	6.88	-	-
-64	14	1	1.90	1.09	1.73	-	-
1965-68	11	6	2.92	2.73	1.73	1.45	.05
-69	10	4	2.96	3.09	1.70	1.40	.05

Group 10: Construction and Materials

Period	Dr.	Cr.	Dr.	Cr.	Dr.	Cr.	
1959-69	1	2	0.72	3.03	1.38	0.53	-
-68	5	4	1.01	2.45	0.53	1.62	.095
-64	4	8	0.73	1.57	0.70	0.77	.055
1965-68	15	2	1.88	1.47	2.92	0.12	.05
-69	6	2	1.14	2.45	0.54	0.97	.071

TABLE 2, -Continued

DEBTOR VERSUS CREDITOR PERFORMANCE

	No. of Firms		Avge. Chge. in Wealth		Std. Dev.		Prob. of Type 1 Error
Period	Dr.	Cr.	Dr.	Cr.	Dr.	Cr.	

Group 11: Textiles

1959-69	-	nil	-	-	-	-	-
-68	5	1	4.04	0.68	2.46	-	.167
-64	6	1	3.64	1.04	1.95	-	.143
1965-68	6	1	1.96	0.44	2.51	-	.143
-69	-	nil	-	-	-	-	-

Group 12: Paper and Forest Products

1959-69	-	nil	-	-	-	-	-
-68	-	nil	-	-	-	-	-
-64	11	6	1.82	1.20	1.51	0.49	.05
1965-68	-	nil	-	-	-	-	-
-69	-	nil	-	-	-	-	-

Group 13: Industrial Mines

1959-69	2	6	3.47	3.77	1.40	2.74	.571
-68	2	6	3.04	3.39	1.35	2.37	.571
-64	2	6	1.76	2.01	0.44	1.14	.571
1965-68	5	5	1.88	1.98	0.90	1.40	.421
-69	5	5	1.96	2.06	0.57	0.98	.421

TABLE 2, -Continued

DEBTOR VERSUS CREDITOR PERFORMANCE

Period	No. of Firms Dr.	No. of Firms Cr.	Avge. Chge. in Wealth Dr.	Avge. Chge. in Wealth Cr.	Std. Dev. Dr.	Std. Dev. Cr.	Prob. of Type 1 Error

Group 14: Steels

Period	Dr.	Cr.	Dr.	Cr.	Dr.	Cr.	Prob. of Type 1 Error
1959-69	-	nil	-	-	-	-	-
-68	-	nil	-	-	-	-	-
-64	-	nil	-	-	-	-	-
1965-68	-	nil	-	-	-	-	-
-69	-	nil	-	-	-	-	-

Group 15: Auto Industry

Period	Dr.	Cr.	Dr.	Cr.	Dr.	Cr.	Prob. of Type 1 Error
1959-69	-	nil	-	-	-	-	-
-68	-	nil	-	-	-	-	-
-64	4	1	1.47	0.94	0.80	-	.400
1965-68	8	1	2.50	1.67	3.06	-	.333
-69	6	1	3.87	1.98	4.83	-	.428

Group 16: Electronics

Period	Dr.	Cr.	Dr.	Cr.	Dr.	Cr.	Prob. of Type 1 Error
1959-69	3	3	1.73	1.45	1.18	0.86	.350
-68	3	3	1.41	1.40	1.09	0.88	.500
-64	3	3	1.03	1.37	0.20	0.81	.500
1965-68	8	2	2.08	1.03	1.98	0.66	.267
-69	7	2	2.26	1.12	2.60	0.67	.333

TABLE 2, -Continued

DEBTOR VERSUS CREDITOR PERFORMANCE

Period	No. of Firms Dr.	Cr.	Avge. Chge. in Wealth Dr.	Cr.	Std. Dev. Dr.	Cr.	Prob. of Type 1 Error

Group 17: General Manufacturing

Period	Dr.	Cr.	Dr.	Cr.	Dr.	Cr.	
1959-69	11	1	2.51	4.39	1.11	-	-
-68	12	1	1.96	3.99	0.95	-	-
-64	11	3	2.15	1.77	1.33	1.16	.05
1965-68	15	2	1.23	4.06	0.75	0.00	.01
-69	13	2	1.76	3.93	1.06	0.77	.05

Group 18: Miscellaneous

Period	Dr.	Cr.	Dr.	Cr.	Dr.	Cr.	
1959-69	12	4	2.61	2.71	2.12	1.04	.05
-68	12	5	2.26	1.97	1.68	1.24	.05
-64	10	8	1.81	1.26	1.34	0.61	.05
1965-68	18	6	1.13	2.42	0.53	1.93	.07
-69	16	6	1.27	3.46	0.53	3.24	.04

TABLE 3, APPENDIX I

DEBTOR INTENSITY VERSUS CHANGES IN WEALTH

Period	No. of Firms	Spearman Rank Correlation (r_s)	Prob. of Type 1 Error
ALL FIRMS			
1965-68	232	-.1841	.005
-69	182	-.2395	.0005
DEBTOR FIRMS ONLY			
1965-68	197	-.1238	.050
-69	152	-.1645	.025
CREDITOR FIRMS ONLY			
1965-68	35	-.2793	.100
-69	30	-.4069	.025

TABLE 4, APPENDIX I

DEBTOR INTENSITY VERSUS CHANGES IN WEALTH: FIRMS WITHOUT INVESTMENTS IN AFFILIATES

Period	No. of Firms	Spearman Rank Correlation (r_s)	Prob. of Type 1 Error
ALL FIRMS			
1965-68	136	-.1922	.025
-69	105	-.1855	.050

TABLE 4, -continued

DEBTOR INTENSITY VERSUS CHANGES IN WEALTH: FIRMS WITHOUT INVESTMENTS IN AFFILIATES

Period	No. of Firms	Spearman Rank Correlation (r_s)	Prob. of Type 1 Error

DEBTOR FIRMS ONLY

Period	No. of Firms	Spearman Rank Correlation (r_s)	Prob. of Type 1 Error
1965-68	122	-.1028	(no significance)
-69	93	-.0870	(" ")

CREDITOR FIRMS ONLY

Period	No. of Firms	Spearman Rank Correlation (r_s)	Prob. of Type 1 Error
1965-68	14	-.0330	(no significance)
-69	12	0.0	(no significance)

TABLE 5, APPENDIX I

DEBTOR INTENSITY VERSUS CHANGES IN WEALTH: FIRMS WITH INVESTMENTS IN AFFILIATES

Period	No. of Firms	Spearman Rank Correlation (r_s)	Prob. of Type 1 Error

ALL FIRMS

Period	No. of Firms	Spearman Rank Correlation (r_s)	Prob. of Type 1 Error
1958-69	62	-.0269	(no significance)
-68	76	-.0322	(no significance)
-64	85	-.0293	(no significance)
1965-68	61	-.3244	.01
-69	61	-.2809	.025

TABLE 5, APPENDIX I

DEBTOR INTENSITY VERSUS CHANGES IN WEALTH:
FIRMS WITH INVESTMENTS IN AFFILIATES

Period	No. of Firms	Spearman Rank Correlation (r_s)	Prob. of Type 1 Error

DEBTOR FIRMS ONLY

Period	No. of Firms	Spearman Rank Correlation (r_s)	Prob. of Type 1 Error
1958-69	46	.0953	(no significance)
-68	57	.0349	(no significance)
-64	64	.0283	(no significance)
1965-68	47	-.2320	.10
-69	49	-.1961	.10

CREDITOR FIRMS ONLY

Period	No. of Firms	Spearman Rank Correlation (r_s)	Prob. of Type 1 Error
1958-69	16	-.3500	.10
-68	19	-.1053	(no significance)
-64	21	-.2247	(no significance)
1965-68	14	-.2396	(no significance)
-69	12	-.2867	(no significance)

TABLE 6, APPENDIX I

DEBTOR INTENSITY VERSUS CHANGES IN WEALTH
FIRMS WITH INVESTMENTS IN AFFILIATES

Period	No. of Firms	Spearman Rank Correlation (r_s)	Prob. of Type 1 Error

ALL FIRMS

Period	No. of Firms	Spearman Rank Correlation (r_s)	Prob. of Type 1 Error
1965-68	96	-.1665	.100
-69	77	-.3299	.005

TABLE 6, -continued

DEBTOR INTENSITY VERSUS CHANGES IN WEALTH
FIRMS WITH INVESTMENTS IN AFFILIATES

Period	No. of Firms	Spearman Rank Correlation (r_s)	Prob. of Type 1 Error

DEBTOR FIRMS ONLY

Period	No. of Firms	Spearman Rank Correlation (r_s)	Prob. of Type 1 Error
1965-68	73	-.1225	(no significance)
-69	57	-.3109	.01

CREDITOR FIRMS ONLY

Period	No. of Firms	Spearman Rank Correlation (r_s)	Prob. of Type 1 Error
1965-68	23	-.3696	.05
-69	20	-.5431	.01

TABLE 7, APPENDIX I

DEBTOR INTENSITY VERSUS CHANGES IN WEALTH
BY INDUSTRY GROUP

Period	No. of Firms	Spearman Rank Correlation (r_s)	Prob. of Type 1 Error

Group 1: Beverages

Period	No. of Firms	Spearman Rank Correlation (r_s)	Prob. of Type 1 Error
1958-69	5	-.1000	(no significance)
-68	10	.1879	(no significance)
-64	11	.0727	(no significance)
1965-68	11	-.4000	(no significance)
-69	6	-.7714	(no significance)

TABLE 7, -continued

DEBTOR INTENSITY VERSUS CHANGES IN WEALTH
BY INDUSTRY GROUP

Period	No. of Firms	Spearman Rank Correlation (r_s)	Prob. of Type 1 Error
Group 2: Food Processing			
1958-69	5	.4000	(no significance)
-68	13	.1923	(no significance)
-64	18	.2714	(no significance)
1965-68	21	-.2870	(no significance)
-69	10	-.6364	.025
Group 3: Merchandising			
1958-69	11	.6636	.025
-68	17	.1054	(no significance)
-64	19	-.1737	(no significance)
1965-68	22	.0322	(no significance)
-69	13	.2473	(no significance)
Group 4: Communication			
1958-69	2	-1.0000	(no significance)
-68	2	-1.0000	(no significance)
-64	2	-1.0000	(no significance)
1965-68	3	.5000	(no significance)
-69	3	.5000	(no significance)

TABLE 7, -continued

DEBTOR INTENSITY VERSUS CHANGES IN WEALTH
BY INDUSTRY GROUP

Period	No. of Firms	Spearman Rank Correlation (r_s)	Prob. of Type 1 Error

Group 5: Utilities

Period	No. of Firms	Spearman Rank Correlation (r_s)	Prob. of Type 1 Error
1958-69	11	-.3182	(no significance)
-68	11	-.3091	(no significance)
-64	14	-.1868	(no significance)
1965-68	14	-.0794	(no significance)
-69	16	-.2176	(no significance)

Group 6: Transportation

Period	No. of Firms	Spearman Rank Correlation (r_s)	Prob. of Type 1 Error
1958-69	3	.5000	(no significance)
-68	3	.5000	(no significance)
-64	3	-.5000	(no significance)
1965-68	6	.8857	.05
-69	5	.7000	(no significance)

Group 7: Pipelines

Period	No. of Firms	Spearman Rank Correlation (r_s)	Prob. of Type 1 Error
1958-69	6	.6571	(no significance)
-68	6	.6571	(no significance)
-64	6	.0857	(no significance)
1965-68	9	.3000	(no significance)
-69	8	.3333	(no significance)

TABLE 7, -continued

DEBTOR INTENSITY VERSUS CHANGES IN WEALTH
BY INDUSTRY GROUP

Period	No. of Firms	Spearman Rank Correlation (r_s)	Prob. of Type 1 Error
		Group 8: Chemicals	
1958-69	2	-1.0000	(no significance)
-68	3	-.5000	(no significance)
-64	3	-.5000	(no significance)
1965-68	9	-.1667	(no significance)
-69	8	.1429	(no significance)
		Group 9: Oil Refining	
1958-69	11	.4818	(no significance)
-68	14	.5956	(no significance)
-64	15	.3321	(no significance)
1965-68	17	.2304	(no significance)
-69	14	.1604	(no significance)
		Group 10: Construction and Materials	
1958-69	3	-.5000	(no significance)
-68	9	-.6500	.05
-64	12	-.5874	.025
1965-68	17	-.2296	(no significance)
-69	8	-.2857	(no significance)

TABLE 7, -continued

DEBTOR INTENSITY VERSUS CHANGES IN WEALTH BY INDUSTRY GROUP

Period	No. of Firms	Spearman Rank Correlation (r_s)	Prob. of Type 1 Error

Group 11: Textiles

Period	No. of Firms	Spearman Rank Correlation (r_s)	Prob. of Type 1 Error
1958-69	4	.8000	(no significance)
-68	6	.9429	.05
-64	7	.6429	(no significance)
1965-68	7	.2500	(no significance)
-69	5	-.3000	(no significance)

Group 12: Paper and Forest Products

Period	No. of Firms	Spearman Rank Correlation (r_s)	Prob. of Type 1 Error
1958-69	15	.1821	(no significance)
-68	16	.3359	.10
-64	17	.3186	(no significance)
1965-68	17	-.3630	.10
-69	16	-.5206	.025

Group 13: Industrial Mines

Period	No. of Firms	Spearman Rank Correlation (r_s)	Prob. of Type 1 Error
1958-69	8	.0238	(no significance)
-68	8	.0476	(no significance)
-64	8	-.1429	(no significance)
1965-68	10	.3091	(no significance)
-69	10	.1394	(no significance)

TABLE 7, -continued

DEBTOR INTENSITY VERSUS CHANGES IN WEALTH
BY INDUSTRY GROUP

Period	No. of Firms	Spearman Rank Correlation (r_s)	Prob. of Type 1 Error

Group 14: Steels

Period	No. of Firms	Spearman Rank Correlation (r_s)	Prob. of Type 1 Error
1958-69	-	-	-
-68	6	.4286	(no significance)
-64	7	.5000	(no significance)
1965-68	7	.9643	.01
-69	7	.8929	.01

Group 15: Auto Industry

Period	No. of Firms	Spearman Rank Correlation (r_s)	Prob. of Type 1 Error
1958-69	4	.8000	(no significance)
-68	5	.4000	(no significance)
-64	5	0.0	(no significance)
1965-68	9	.4333	(no significance)
-69	7	.2500	(no significance)

Group 16: Electronics

Period	No. of Firms	Spearman Rank Correlation (r_s)	Prob. of Type 1 Error
1958-69	6	.4857	(no significance)
-68	6	-.0286	(no significance)
-64	6	-.1429	(no significance)
1965-68	10	.2364	(no significance)
-69	9	.2500	(no significance)

TABLE 7, -continued

DEBTOR INTENSITY VERSUS CHANGES IN WEALTH
BY INDUSTRY GROUP

Period	No. of Firms	Spearman Rank Correlation (r_s)	Prob. of Type 1 Error

Group 17: General Manufacturing

Period	No. of Firms	Spearman Rank Correlation (r_s)	Prob. of Type 1 Error
1958-69	12	.3287	(no significance)
-68	13	.1703	(no significance)
-64	14	-.0857	(no significance)
1965-68	17	-.5221	.025
-69	15	-.4893	.050

Group 18: Miscellaneous

Period	No. of Firms	Spearman Rank Correlation (r_s)	Prob. of Type 1 Error
1958-69	16	-.1618	(no significance)
-68	17	.0245	(no significance)
-64	18	.1022	(no significance)
1965-68	24	-.3009	.10
-69	22	-.3597	.10

EXHIBIT 1

FACULTY OF BUSINESS ADMINISTRATION AND COMMERCE
Division of Business Policies

THE UNIVERSITY OF ALBERTA
EDMONTON 7, CANADA

I am a candidate for the degree "Master of Business Administration" here at the University of Alberta, who would greatly appreciate your assistance in a research effort aimed at fulfilling my thesis requirement.

Briefly, the substance of my research effort, entitled "Inflation and the Redistribution of Wealth Among Business Firms in Canada", is an empirical investigation into the validity of two hypotheses which have been expressed as textbook explanations of how business firms gain in real wealth terms, during inflationary periods.

These hypotheses, supported by such eminent economists and scholars as J. M. Keynes and E. J. Hamilton are:

1) the debtor-creditor hypothesis --which states that firms gain during inflation by paying-off fixed-dollar obligations with depreciated money; and,

2) the wage-lag hypothesis --which states that inflation causes wages to lag behind prices so that wealth is redistributed from wage-earners to the owners of firms.

I cannot overstate how much your co-operation in this matter will be appreciated since, without your assistance, the research must be abandoned. Please be assured that the information requested on the enclosed form will be kept strictly and completely confidential. The figures reported will not be communicated directly or indirectly to anyone, nor will they be at any time related to a particular firm.

Should you be interested in the research results, check the appropriate box on the form and I shall be pleased to forward you a copy of the thesis abstract. Please have the enclosed form filled out and mailed to me at your earliest convenience.

Sincerely yours

R. Wayne Jollineau

RWJ/mm
Encl. (1)

Please Return One Copy in The Envelope Provided

Company number _____

1. All hourly-rated workers

Year	Total Hours Worked	Gross Wages Paid	*Fringe benefits, Premiums, etc.
1958			
1959			
1960			
1961			
1962			
1963			
1964			
1965			
1966			
1967			
1968			
1969			

2. Salaried Employees (all employees below the vice-presidential level, paid on other than an hourly basis.)

Year	** Days worked	Gross Salaries Paid	*Fringe benefits, Premiums, etc.
1958			
1959			
1960			
1961			
1962			
1963			
1964			
1965			
1966			
1967			
1968			
1969			

*Include the value of all company-paid benefits and services including stock options, bonuses, etc., (as valued when "paid", net of employee contributions by payroll deduction.)

**May be expressed as equivalent man months, man years, etc. (please define)

3. I would like a copy of the thesis abstract (check) _____.

DECLARATION: this form and all information on it will be kept strictly confidential by the undersigned:

_____

EXHIBIT 2   APPENDIX 2

FACULTY OF BUSINESS ADMINISTRATION AND COMMERCE
Division of Business Policies

THE UNIVERSITY OF ALBERTA
EDMONTON 7, CANADA

Dear Sir

Some three weeks ago I requested information regarding employee earnings and hours or work from a number of firms operating in Canada, including your company. This information was to be used in completing my thesis requirement for the degree "Master of Business Administration".

Many of the responding firms found themselves unable to provide the data, in the detail requested, for a variety of reasons (e.g. shortage of staff hours available to dig the information out, recording systems which simply did not make the information readily available, reorganization and merger activity, etc.)

Obviously my request was, in the majority of cases, somewhat less than reasonable --hence it would seem appropriate for me to modify my plea for assistance.

Could I please prevail upon you to supply a much more simplified set of data for the years 1957 through 1969, namely;

1) total employees (please estimate if an "average" not available)

2) total wage bill (including benefits, but excluding officers salaries and benefits if possible, if not, please note that such are included.)

As a broad guide, could you give me the information such as you would have provided it in your annual reports, had you deemed it appropriate to do so.

Your cooperation in this matter would be greatly appreciated. Please be assured that the information will be treated in strict confidence. Upon completion of the thesis, a copy of the abstract will be mailed to you.

Sincerely yours

R. Wayne Jollineau

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APPENDIX 3

CHART 1

REGRESSION OF THE RATIO OF NET MONETARY STATUS TO EQUITY

ON CHANGES IN FIRMS' WEALTH

1968-69

$Y = 1.0884 - .1056X_1$

(Y) Change in Wealth

(X_1) Ratio of Net Monetary Status to Equity $(X10^2)$
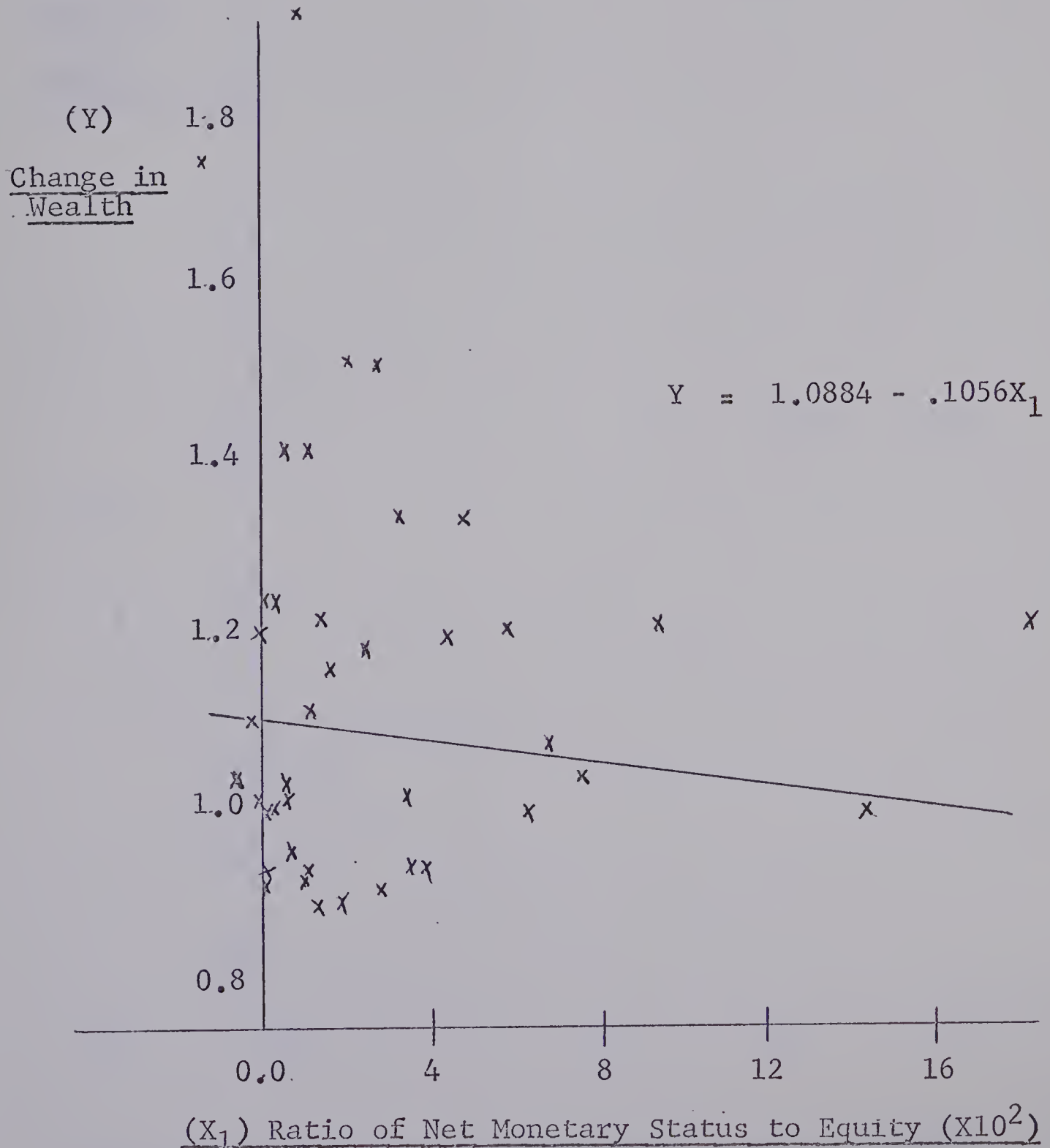
APPENDIX 3

CHART 2

REGRESSION OF THE RATIO OF MAXIMUM WAGE-LAG GAIN TO EQUITY
ON CHANGES IN FIRMS' WEALTH
1968-69

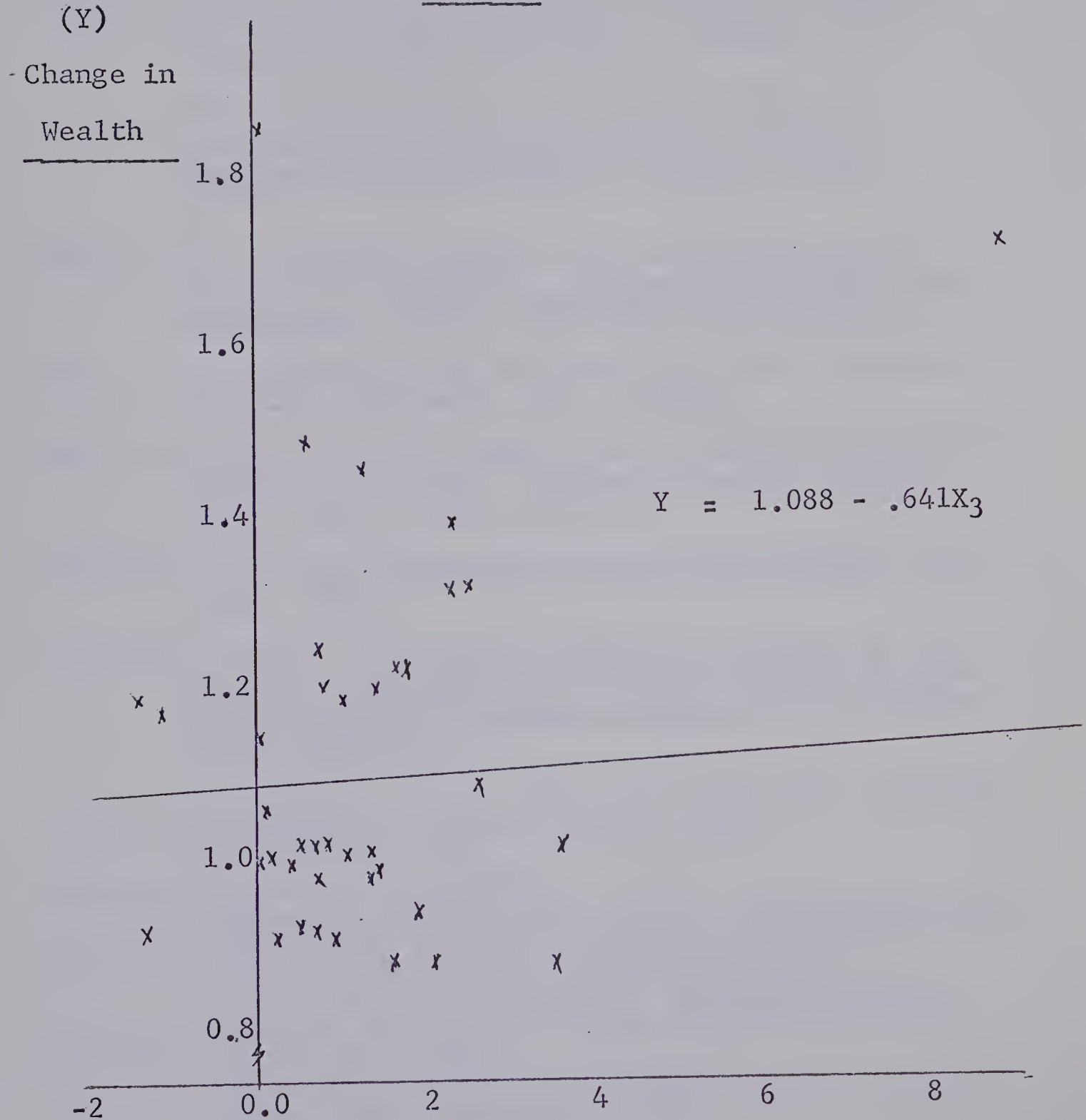
(Y)

Change in

Wealth

$Y = 1.088 - 1.477X_2$
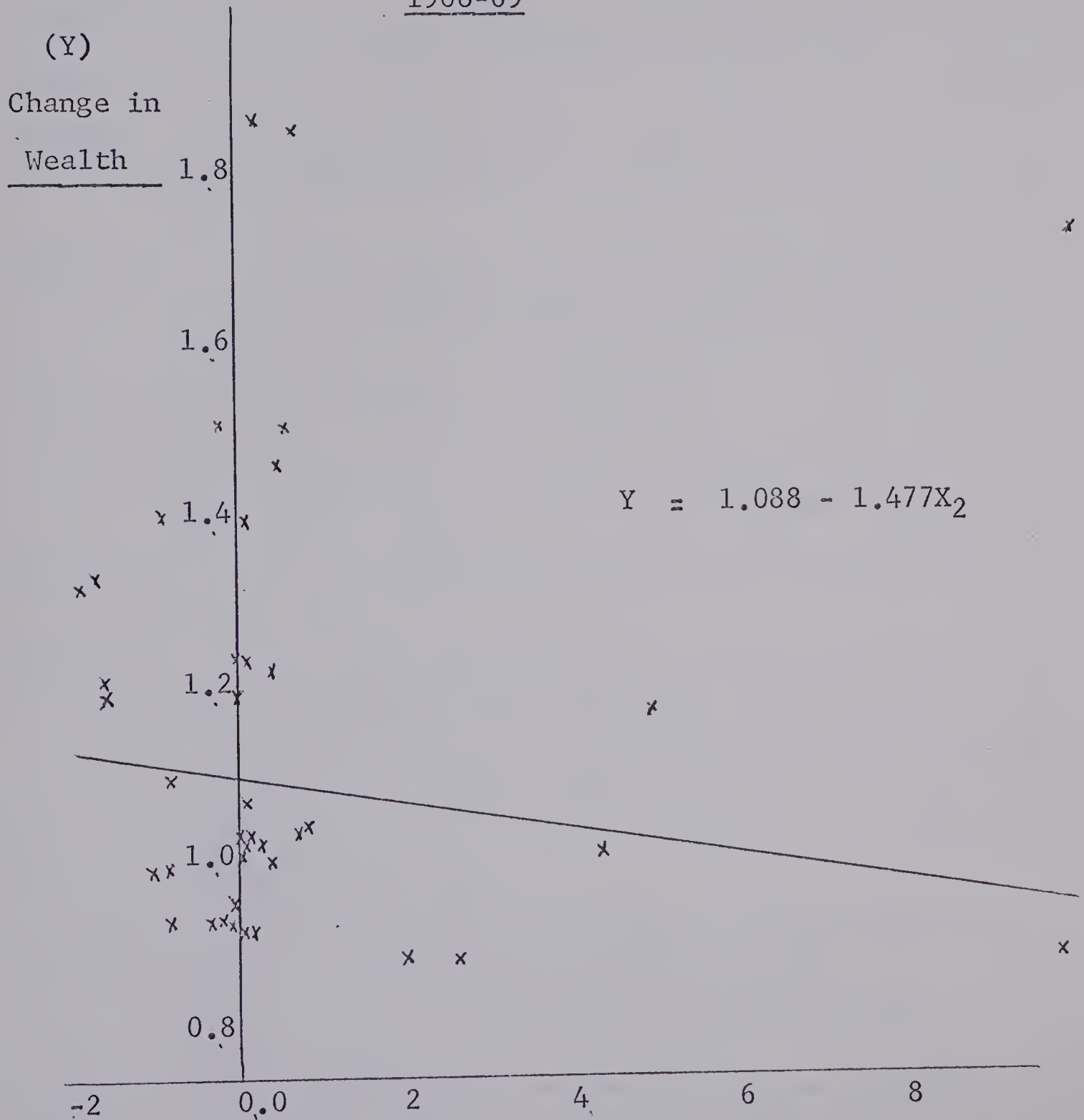
(X_2), Ratio of Maximum Wage-lag Gain To Equity $(X10^2)$

APPENDIX 3

CHART 3

REGRESSION OF THE RATIO OF CHANGES IN SALES VOLUME TO EQUITY

ON CHANGES IN FIRMS' WEALTH

1968-69

(Y) Change in Wealth

$$Y = 1.088 - .641X_3$$

(X₃), Ratio of Change in Sales Volume to Equity

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